

AFHRL-TR-76-69

AIR FORCE



ADA 042605

HUMAN RESOURCES

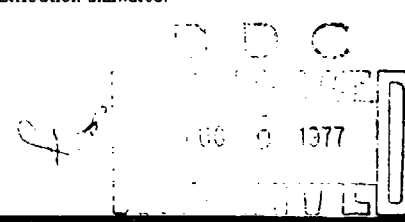
**RESEARCH ON THE MANAGEMENT
TRAINING, AND UTILIZATION OF
LOW-APTITUDE PERSONNEL:
AN ANNOTATED BIBLIOGRAPHY**

By
Forrest R. Ratliff, Lt Col, USAF
James A. Earles, Sgt, USAF

PERSONNEL RESEARCH DIVISION
Lackland Air Force Base, Texas 78236

December 1976
Final Report for Period 1 October 1971 - 30 June 1976

Approved for public release; distribution unlimited.



LABORATORY

AU NO. _____
DDC FILE COPY

**AIR FORCE SYSTEMS COMMAND
BROOKS AIR FORCE BASE, TEXAS 78235**

NOTICE

When US Government drawings, specifications, or other data are used for any purpose other than a definitely related Government procurement operation, the Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise, as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

This final report was submitted by the Personnel Research Division, Air Force Human Resources Laboratory, Lackland Air Force Base, Texas 78236, to the Office of the Assistant Secretary of Defense (Manpower and Reserve Affairs).

This report has been reviewed and cleared for open publication and/or public release by the appropriate Office of Information (OI) in accordance with AFR 190-17 and DoDD 5230.9. There is no objection to unlimited distribution of this report to the public at large, or by DDC to the National Technical Information Service (NTIS).

This technical report has been reviewed and is approved for publication.

LELAND D. BROKAW, Technical Director
Personnel Research Division

DAN D. FULGHAM, Colonel, USAF
Commander

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER AFHRL-TR-76-69 ✓	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle) RESEARCH ON THE MANAGEMENT TRAINING, AND UTILIZATION OF LOW-APTITUDE PERSONNEL AN ANNOTATED BIBLIOGRAPHY	5. TYPE OF REPORT & PERIOD COVERED Final Rpt 1 October 1971 - 30 June 1976	6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(s) Forrest R. Ratliff James A. Earles	8. CONTRACT OR GRANT NUMBER(s)		
9. PERFORMING ORGANIZATION NAME AND ADDRESS Personnel Research Division Air Force Human Resources Laboratory Lackland Air Force Base, Texas 78236	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 62703F 44990741		
11. CONTROLLING OFFICE NAME AND ADDRESS HQ Air Force Human Resources Laboratory (AFSC) Brooks Air Force Base, Texas 78235	12. REPORT DATE December 1976	13. NUMBER OF PAGES 94	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) Office of the Assistant Secretary of Defense (Manpower & Reserve Affairs), Directorate for Manpower Systems Evaluation Washington DC 20301	15. SECURITY CLASS (of this report) Unclassified	16. DECLASSIFICATION/DOWNGRADING SCHEDULE	
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.			
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)			
18. SUPPLEMENTARY NOTES			
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) education new standards men veteran's adjustment literacy personnel low-aptitude Project one hundred thousand management testing manpower training			
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report summarizes the manpower research literature describing the performance, training, and utilization of personnel entering the armed forces under reduced physical and mental standards adopted in 1966. Up to 100,000 men were inducted each year under these new standards during the 1966 through 1973 time period. Most of these accessions qualified for military service under the reduced mental standards. This bibliography is presented in two sections. The first summarizes the research in each of the major areas of investigation, and assesses the contribution to the state-of-the-art and the implications of this resource for management. The second section provides summaries of the manpower research literature dealing with low-aptitude			

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

404415

118

Unclassified

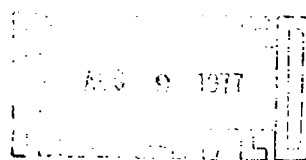
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Item 20 Continued.

personnel. The summaries are designed to provide general information concerning the problems, methods, and findings of the studies.

The general findings in the studies described are that low-apptitude accessions are trainable and perform successfully in a limited number of career areas. However, they require more time to complete training and have slightly higher attrition rates than higher aptitude accessions. An additional result found in the studies is that military service impacted favorably on post-service adjustment of low-apptitude personnel. They not only achieved a higher education level than non-veterans with similar aptitudes, but they also ended up in higher skilled, higher paying civilian jobs.

1. Title	2. Author
3. Date	4. Page
5. Subject	6. Summary
7. Remarks	8. Indexing
9. Distribution	10. Comments
11. A	



Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

PREFACE

Appreciation is expressed to Dr. Aaron Nadel and Mr. Thomas Lester of the Manpower Development Division, Alexandria, Virginia, for their professional assistance in reviewing and evaluating areas of research literature appearing in this report.

TABLE OF CONTENTS

	Page
Section One: Commentary	5
Introduction	5
Scope.	6
Background	7
Manpower Facts on Project 100,000.	8
Performance Assessment	9
Training Research.	12
Literacy Research.	15
Test Development	17
Post-Service Adjustments	19
Section Two: Annotated Bibliography	20
Index.	20

RESEARCH ON THE MANAGEMENT, TRAINING, AND UTILIZATION
OF LOW-APTITUDE PERSONNEL: AN ANNOTATED BIBLIOGRAPHY

SECTION ONE: COMMENTARY

INTRODUCTION

This bibliography is designed to provide the military manpower manager with a convenient reference to the manpower research literature dealing with the performance, capabilities, trainability, and utilization of low-aptitude personnel.

The problems associated with the management and utilization of low-aptitude manpower are pervasive within the personnel system in that normal classification, assignment, and training procedures require some modifications if large numbers of low-aptitude personnel are to be dealt with effectively.

The problem of the utilization of low-aptitude personnel in the military has arisen periodically. Every national mobilization of manpower has produced the need to relieve pressure on the national manpower pool by more extensive utilization of low-aptitude personnel. During World War II and the Korean conflict, these pressures led to a number of research studies. These earlier studies dealt with some of the same basic issues that were considered in the decision to adopt the "New Standards" for military accessions in 1966. However, these older studies, performed without the extensive electronic data processing support available to research scientists by the 1960's, were limited in scope and dealt with relatively small populations. Additionally, many of the military functions to which low-aptitude personnel were assigned several decades ago are now technically more complex. Thus, technological advance has added a dimension of complexity to the problem, particularly in the area of training.

Although research on the performance and utilization of the low-aptitude population has been topical and interest has diminished during times of lessened manpower stress, the problem of effective utilization remains. It was considered useful to bring the results of this last round of studies together to define the range of problems encountered and provide an overview of the research both for the benefit of the present day manager with an immediate need for information and for the benefit of those researchers who will be tasked with this problem at some future date. The manager or researcher will have immediately available a reference to most of the research published during this New Standards time. Unfortunately, there were a few significant studies performed early in the New Standards

period that were never formally published and thus are not available. The authors are personally aware of one such study which ably demonstrated the advantages of reducing written content and developing hands-on, step-by-step modular learning sequences in technical training courses, which was influential in initiating the successful redesign of some technical school courses, but which is now lost to managers and researchers alike.

A secondary purpose of this paper is to provide an evaluation of the research performed and, where pertinent, to call attention to those findings which provide advances in the state-of-the-art and which may be of use if the input of low-aptitude personnel increases in the future. Especially noted is that work which has led to creative or innovative developments. Despite the urgency of the utilization problem during the 1966-1972 time period, the research presented here represents a substantial effort to address the basic issues in this area. Further, the research demonstrated that even under the conditions of time pressure and expediency, creativity does emerge, and significant advances in the state-of-the-art are made.

Scope

Technical reports and research memoranda, generated from manpower research beginning in 1966 and continuing through 1975, have been summarized for inclusion in this bibliography. The studies, derived from data needs on contemporary issues, are directly germane to the problems of today's manpower manager. The research was performed in five general areas; these were (1) performance evaluation, (2) training, (3) literacy, (4) test development, and (5) post-service adjustment.

Performance evaluation, which was of most crucial concern to management, yielded the largest number of studies. The problems with training methodology and the effort to increase the effectiveness of the training of the low-aptitude person generated the next largest number of reports. Fewer reports were produced in the areas of literacy training, testing, and post-service adaptation.

The bibliography is produced in two sections. The first section is a narrative description directing the reader's attention to some of the more useful studies in the different areas of research. The second section contains summaries of the research memoranda and reports. The summaries were designed to provide information on the research problems, methods, and findings. More emphasis was given to a description of the findings to make this report practically useful to managers as well as research workers.

Background

A program was announced by Secretary of Defense Robert McNamara in August 1966 to reduce the mental standards for acceptance into the armed services. Provision was also soon made for accepting some men with specific remedial physical defects. A major benefit expected from the program was that the remediation and intensive training associated with entry into the service would better enable the individual to adapt to both the military environment and future civilian life.

Those entering military service under the new physical and mental standards accounted for 364,000 accessions during the time period from October 1966 through December 1971. A large majority (91%) were accepted under the reduced mental standards. It was concern over the performance ability, trainability, and utilization of this low aptitude portion of the New Standards accessions which generated much of the research annotated in this bibliography. In particular, most of the research assesses the performance attributes of men classified as Category IV's. These are men who scored 10 to 30 on the Armed Forces Qualification Test (AFQT).

The classification, assignment, training, and utilization programs of the military services were structured to accommodate a higher aptitude, more literate population. There was little recent (post Korean conflict) institutional experience in the processing of relatively large numbers of low aptitude personnel. Based on the knowledge available, however, there was an expectation that classification and assignment procedures would direct most of the Category IV personnel to a rather narrow range of occupational specialties, and that increased attrition and disciplinary incidents would be experienced. Obviously, there was a need to develop objective data on the performance of the New Standards accessions in different specialties and in the different military services. It was felt, however, the impact of the problems brought about by low-aptitude accessions could be reduced through improved management control and improved technology in those personnel functions related to classification, assignment, training, performance evaluation, and utilization. Two major programs were initiated to achieve these goals.

The first undertaking was the establishment of a "Project 100,000" action office within the Office of the Assistant Secretary of Defense (OASD) (M&RA) to provide high level management, policy development, and coordination for the several projects required to ensure effective utilization of New Standards personnel. The second was the establishment of a manpower management data reporting system to support Project 100,000 in monitoring the essential parameters affecting assignment, training, attrition, disciplinary incidents, career progression, and utilization. This data reporting system was much more sophisticated than previous systems. The Category IV population in each service was monitored on an array of descriptive parameters.

Additionally, a factor that added a significant order of quality to this program was the selection of a control group of higher aptitude personnel which was monitored on the same parameters as the Category IV population (Greenberg, 1974). Thus, comparisons made between the two groups provided for valid statistical inference as well as management decision making.

Manpower Facts on Project 100,000

The program received its name from the goal of accepting 100,000 men per year who would formerly have been rejected. Although only 354,000 accessions came into the armed services under the program during its five years and two months of existence, the program did have a peak input of more than 100,000 men in FY 1969.

Quotas were established which resulted in about 67% of the New Standards men being assigned to the U.S. Army with the remainder being distributed among the other services. The men came primarily from the South (over 45% of the Project 100,000 men versus less than 30% of the control group). Many were Black (about 40% versus less than 10% of the controls), fewer were high-school graduates (under 45% versus greater than 75%), and low scorers on the AFQT (an average near the 15th percentile versus an average above the 50th percentile for the controls) (Greenberg, 1969).

The Project 100,000 accessions were assigned to more than 200 different occupational specialties most of which were not highly technical. Over a third were assigned combat jobs. The next most common assignments were in the fields of food service, supply, wire communications, motor transportation equipment repair, construction, and police (Greenberg, 1969). These non-combat jobs had direct or related counterparts in the civilian economy.

Although the New Standard accessions did not perform as well as the more highly educated men, most became highly satisfactory servicemen (Greenberg, 1969). They did comparatively well in basic training, occupational training, and promotions. They did this while competing in the same courses with the higher ability accessions. They were, along with the more highly educated trainees, provided with extra help but only as needed.

The Project 100,000 program successfully increased the manpower pool available to the armed services selection system. The cost to the services was not much greater than \$200 per New Standards man over the cost of a higher ability accession (Greenberg, 1969). The program was terminated in December 1971 in line with the DoD Appropriations Act of 1972 which prohibited the establishment of quotas based on mental categories.

PERFORMANCE ASSESSMENT

A determination of the extent to which Category IV personnel could perform effectively in a military environment was essential to the development of viable manpower management programs and policies for this group. In general, concern over New Standards accessions focused on such factors as (1) the range of occupations in which they could perform effectively, (2) the number which could be assimilated in a given rating or military occupational specialty (MOS), (3) the disciplinary incidents and attrition rates they would produce, (4) their trainability, (5) the amount of supervision they would need, and (6) their general effectiveness in a unit.

The resolution of issues related to these problems raised a need for information which went considerably beyond the scope of the data available from earlier studies (World War II and Korean conflict periods) on these problems. The goal of assessing on-the-job performance of a particular group, in the context of other on-going activities, had not been accomplished successfully in the past even with more highly qualified troops. Thus, there was a question whether current evaluation technology could provide data yielding statistically sound estimates of performance in a usable number of circumstances. In general, the evaluation of individual or group job performance has been an especially difficult problem in large personnel systems. The inability to develop a reliable, useful criterion for actual job performance has been central in the failure to advance the state-of-the-art more rapidly in selection, classification, and other activities.

The pressures for timely data that would withstand a rigorous critique and provide a solid base for administrative use were such that a number of studies addressing various aspects of the performance problem were planned and initiated. These studies on manpower performance undertaken during the Project 100,000 period are classified into four categories: (1) comparative studies, (2) characteristics of deserters, (3) biographical and motivational characteristics, and (4) experimental studies of individual performance.

The comparative studies are basically state-of-the-art field studies in which the investigator uses surveys, questionnaires, personnel records, personnel reports, and other data to develop a statistical base of performance data on a population to be used in making comparisons with other populations. Ten of the referenced studies are classified as comparative studies with populations ranging from as few as 30 in a single group to the tens of thousands depending upon the purpose and scope of the study. The early studies in this area tested proposed methodology and provided data on the performance of Category IV personnel in the context of training

and job situations. In one of the earliest of these investigations, Goffard et al. (1966) compared a group (243) of Category IVs and a closely matched group of non-Category IVs on a number of achievement measures in 22 companies in Basic Military Training (BMT). The Category IVs were consistently lower on most measures of performance and were rated lower by their peers and supervisors on leadership potential. However, many of them were capable of benefiting from training and performing on the job.

Plag, Goffman, and Phelan (1967) conducted a rigorous, descriptive study on a larger sample of sailors (1,260 Cat. IVs) and Marines (733 Cat. IVs) to assess their performance longitudinally and retrospectively over a four-year period using available personnel records, reports, and survey techniques. The control group was carefully selected to have a mean AFQT score of 50. Three evaluations were made, the first conducted at the end of basic training, the second after two years of service, and the last after four years of service. The major finding was that 64 percent of the sailors and 74 percent of the Marine Category IVs completed their tours and were recommended for reenlistment compared with 75 percent and 85 percent respectively of their average-ability counterparts.

In a similar vein, the Department of Defense (DoD) (1969) issued a report based on a Project 100,000 population of over 200,000 New Standards personnel in the Army, Navy, Air Force, and Marine Corps, which was compared with a (smaller) control group on a number of parameters. Results showed that the Category IV personnel were lower on all performance indices although a large proportion completed tours and were recommended for reenlistment.

Studies similar in design and content were soon reported by a number of authors; i.e., Grunzke et al. (1970), Cory (1971), and others. The findings from these studies over time and across populations and investigators were remarkably similar. The consistency of the findings and their congruence with both earlier hypotheses and experience in the field led to increased confidence that the accumulating information base provided a solid foundation for decision making and policy formulation.

Research on the characteristics of deserters was conducted by Boyd and Jones (1973) and Drucker and Schwarz (1973) who analyzed many of the variables associated with personnel who go AWOL or who desert as compared to personnel who do not. The research in both studies investigated background variables such as age, education, measured aptitude, socio-economic level, marital status, and induction method. These variables had a low, positive correlation with absenteeism, with the younger, unmarried enlistees with lower education, aptitude, and socio-economic level being the most prone to absenteeisms. This result is in line with other research which indicates that personal background variables form a cluster of reliable

information which provides low, positive correlations with unsatisfactory performance. However, despite the reliability of the relationship between background factors and performance, a large majority of those in the "predicted as poor performers" group do perform satisfactorily. The problem of developing a selection instrument which would provide a more accurate screening of the poor performers is as difficult as it is desirable. However, if better screening could be effected, the benefits would be twofold--the reduction in loss of manpower would represent a substantial savings in personnel cost, and many individuals would avoid a negative experience during a developmental period of life.

Changes in attitudes, motivations, and aspirations of Project 100,000 personnel were studied longitudinally by Katz and Goldsamt (1971) and Federman et al. (1973). Generally, Category IVs had positive feelings towards the Navy, were people oriented, thought well of themselves, and had lower aspirations than higher ability peers.

The final category of personnel assessment, the measurement of individual job performance, has always posed a number of problems. The evaluation of on-the-job performance in such a manner as to be useful in determining individual qualities associated with proficiency has proved to be extremely difficult. As a consequence, most research efforts in this area use questionnaires and rating forms. This procedure usually limits the reliability and validity of the obtained results.

Research performed under the Human Resources Research Organization (HumRRO) code name UTILITY by Vineberg, Sticht, Taylor, and Caylor was designed to resolve some of the problems which often limit the usefulness of performance evaluation research. This study included a comprehensive job analysis of the several occupational specialties investigated, the development of job sample tests for administration on the work site, the creation of detailed job knowledge tests, and interviews with job incumbents, peers, and supervisors. The sample was carefully selected to have continuous experience on the job. The extensive resources invested in the evaluation battery coupled with the use of highly trained personnel in the on-site data collection program contributed to the success of the study. This was one of the few studies to investigate the relationship between job performance, job knowledge, measured aptitude, and job experience in a field study situation. The data from this study supported assumptions that job performance has a positive, significant relationship with aptitude and with job experience, and that longer job experience was required for those with low aptitudes to perform at the journeyman level. Many of the Category IVs required twice as long to reach journeyman level as did Category Is and IIs.

The significance of the research performed under Project UTILITY lies in the effort to develop a sufficiently sensitive job performance

criterion and then to discriminate on this performance criterion with aptitudinal and experimental parameters. Very few research efforts in the past have utilized such a broad-scaled, multi-variate approach to the performance prediction problem. The finding that job sample test performance is related to aptitude extends in a most important manner the previously known fact that performance in technical school is related to aptitude. The way is opened for an effort to validate selection and classification procedures based on aptitude and other types of testing.

However, this effort will not be easy. One of the findings in the UTILITY data was that one-third of the Category IV subjects who passed the job sample and job knowledge tests at the journeyman level were not qualified for reenlistment due to low aptitude scores on an Army classification test. Also, approximately one-third of those unable to pass the job tests at the journeyman level were eligible for reenlistment based on their scores on that Army classification test.

Project UTILITY was quite expensive in terms of funds and personnel required. However, it provided information on performance factors that was extremely useful to both management and the research community. Such high quality data are urgently needed on a broad range of personnel and occupations to support improved manpower utilization. Whether such data can be obtained with a smaller investment of time and personnel than that required for Project UTILITY remains to be determined.

TRAINING RESEARCH

Training is one of the most pervasive and necessary activities conducted within the armed services. It supports, at some stage, almost every function or operation carried out by military personnel. As such, it accounts for a significant portion of personnel costs and personnel time. Thus, economic considerations have given impetus to research efforts on such training factors as course length, graduate quality, and attrition rates.

The initiation of Project 100,000 brought an influx of trainees into the technical schools who had lower aptitudes, less education, and lower reading levels than previous trainees. This placed a heavy burden on the training programs in a number of occupational areas. Technical schools generally had course lengths, content, and literacy levels adapted to a higher ability recruit. In fact, the established aptitude minimums for various career fields were often determined by the aptitude necessary to complete technical school courses. This newly

increased need to reduce anticipated attrition in training among low-aptitude accessions, to reduce training time, particularly for those with only two-year service obligations, and to accommodate widely varying aptitude levels within the same training classes led to the initiation of numerous research efforts aimed at developing training methods that would ensure that on-job skills would be available.

Earlier research in this area emphasized training course modification in which a methodology was sought for adapting technical training courses to meet the needs of both Category IV personnel and their higher ability peers. Funds were provided for the modification of some high density technical training courses such as Wheeled Vehicle Mechanics, Organization Supply Clerk, Engineering Equipment Mechanics, and Material Facilities Specialist. These course modification efforts were preceded by a thorough and systematic job analysis. This resulted in a reduction of the written content and an increase in the use of hands-on, step-by-step modular learning sequences. The goal of improved learning by Category IV personnel without loss of skill for higher aptitude students was often achieved. Many courses were also shortened by as much as thirty percent without measurable loss in student mastery.

The demonstration that Category IV personnel could be successfully trained in a few occupational specialties raised questions concerning the extent to which they could be trained and utilized in other occupational areas. It was possible that some technical training courses would require no modification. It was even considered possible that special training in literacy and basic arithmetic skills for Category IV personnel would play a role at least as important as course modifications. When modification was necessary, there was a chance that the use of some new instructional technology would be more successful than simply reducing the reading level of the course content and placing more emphasis on performance tasks.

With the initiation of Project 100,000, evaluations were started on the performance of Category IV students in several on-going training courses to determine their performance level and to obtain information for possible revision of course content. Examples of investigations performed are those on commissarymen and on shipfitters by Hooprich and co-researchers in 1967 and 1968, on storekeepers, steelworkers, and equipment operators by Standlee and Saylor in 1967 and 1968 for the Navy, and Montague and Showel's (1969) research on eight combat support courses conducted by HUMPRO for the Army. The New Standards students were relatively less literate, and they performed near the bottom of their classes although most were able to meet the end-of-course criteria. Anderson (1969) performed a fleet follow-up on Category IVs and higher ability graduates from Navy training schools and found that, while

there are many significant differences between the two groups, there was also considerable overlap. He recommended assignment of Category IVs to jobs with high practical performance content and low reading requirements which permitted extensive supervision.

As expected, many of the on-going training courses were not appropriate for low-aptitude personnel. A more formal and structured investigation was undertaken to develop more effective modified courses and to develop and incorporate new teaching methods. These studies often used a classroom situation as a test bed. Special curricula were developed for instruction in such diverse skills as electronic instrument reading, guided missile console operation, soldering, arithmetic computation, and fire protection—see Steinemann (1968), Grimsley (1969), Steadman et al. (1969), Main (1969 and 1970), Hooprich and Matlock (1970), Van Matre (1971), and Sellman (1970).

It took many increments of research progress in the late 1940's and early 1950s to lay the theoretical and methodological base for the substantial advances to come. It required a substantial amount of research development on learning skills to provide the capability for taking a training course apart and putting it back together according to a formula for more effective presentation. During this period, some research studies seemed to raise more questions than they answered. However, this period was followed by a stage of consolidation and highly visible productivity.

In the late 1950s and the 1960s, a rich array of new training concepts based on principles of human learning was devised to organize information for more efficient training. These concepts, in many cases, were brought to maturity and useful application by the research conducted to support Project One Hundred Thousand. One of the very productive concepts, that of programmed learning, was based on (1) the sizing of information bits for easy comprehension, (2) student interaction with each information bit, (3) immediate knowledge of results, and (4) self pacing. Another concept that resulted in many training economies and improved training for the lower aptitude was that of developing concrete "hands on" performance modules with lower lecture and reading requirements. The third concept developed and implemented during this period was that of peer instruction. This involved a student teaching a student a skill until he was capable of instructing another student. This later instruction tended to re-enforce the learned skill. Peer instruction provided one of the first skills training programs to aim for 100% mastery of course content. The fourth concept developed was that of the automated tutor, a self-contained programmed package presented on a small portable audio-visual device designed for use on the job at any location, even remote sites. Because of the uniqueness of these last two concepts, they are given further elaboration.

Peer Instruction

The HumRRO proposed a research scheme for integrating available learning theory into a peer instructional methodology. The goal was a

low cost instructional model which would accommodate a wide range of aptitudes and achieve uniform end-of-course mastery levels. The target for content mastery for all students at every aptitude level was 100 percent.

The resulting model (Weingarten, Hungerland, and Brennan, 1972) used peer instructors to teach performance oriented tasks. The experimental end-of-course data indicated that the goal of 100 percent mastery of content was achieved for all aptitude levels, with peer instructed students out-performing the conventionally instructed students by large margins in every category of comparison.

The impact of this HumRRO development lies in its expansion of the traditional student role to include task instruction and the elevation of the instructor's position to that of an information and quality control manager. The broad management implications of this instructional model are that (1) quality of training output is now more subject to specification than ever before, (2) where deficiencies exist, there is now a method for isolating the cause and determining if remediation is within the state-of-the-art, (3) input constraints based on literacy level are all but removed, and (4) flexibility in content is enhanced since educational software is not employed.

The success of this creative approach to the broad training problem has been capitalized upon by the Army in an expanding array of training courses. The peer instructional model is now receiving an experimental assessment in an Air Force technical training center.

Automated Tutor

One of the very productive developments from further training research was the creation of a security police training course with presentation on a portable audio-visual device. This work by Pieper, Catrow, Swezey, and Smith (1973), with Air Force and OASD (M&RA) support, provided flexibility and economy in standardized training at remote sites, gave a substitute for on-the-job training (OJT), and permitted upgrading in the field. Instructor, supervisor, and travel costs are all minimized under the Automated Apprenticeship Training (AAT) technique. Comparisons were made between the AAT students, technical school graduates, and students who received OJT training through career development courses. The AAT and technical students were equivalent on tests of job performance and job knowledge, and both were superior to the OJT trainees. The AAT does this with significant savings of student and supervisor manhours and, therefore, is a valuable step forward in training methods development.

LITERACY RESEARCH

At any one time, DoD accessions fall into a wide range of reading ability. The number of recruits accepted with low reading ability

depends upon a number of factors including manpower needs, availability of recruits, recruitment standards, and administrative policy. In general, those accessions with less education and lower aptitude tend to have lower reading abilities. Hence, Project 100,000 brought an influx of poor readers into the service, but that only exacerbated an ever-present problem. It is not expected that the literacy level of DoD accessions will rise above that of the civilian community, and, at this time, the Office of Education estimates that seven million of the forty-five million children now in public schools will leave with inadequate reading skills. Some will be high school graduates. McGoff and Harding (1973) reported that 43 percent of the students in the services' remedial reading classes were high school graduates. Thus, even optimistic projections of manpower recruitment must include those with reading disabilities.

A recruit's lack of reading ability, apart from his aptitude, educational level, or experience, becomes a problem when he must obtain information about his job or a personal situation from written material. However, the proficiency level below which low reading ability becomes a problem for the recruit in training, work, or personal situations has not been objectively or satisfactorily determined. The Army, Navy, and Air Force have each empirically determined eligibility for remedial reading training (low mental category score or job problems and a reading level below fifth or sixth grade). McGoff and Harding (1973) reviewed and described the literacy training programs of the military services.

Fisher (1971a and 1971b) attempted to evaluate the effects of low reading ability on performance among two samples of Category IV personnel after 23 months of active duty. He divided one of the samples of Category IVs into two literacy level groups using test scores on word knowledge and reading ability, with a fifth-grade reading level as the division point. When the groups were compared on 18 variables available in personnel records, significant relationships were found only between literacy level, occupational specialty, and reenlistment eligibility. In the second study, Category IV remedial reading students were divided into those who achieved a fifth-grade reading level and those who did not. After 23 months, there was a slight tendency for the "successful" students to have achieved a higher pay grade and to have a higher reenlistment eligibility.

The failure of lower reading ability to be a detectable influence on rated performance or the other personnel variables suggests that reading ability may have only slight or moderate influence on job performance. It may be, however, that differences in reading ability between these Category IV groups were too small to differentiate training, job performance, or situational factors. Also, the variables used may not have

been sufficiently sensitive to detect variations in performance. Further, the occupational specialties of most of the subjects required little reading, minimizing the effects reading level could have on performance. Thus, the relationship between reading level and performance is, at best, only partially uncovered.

Other studies have dealt with concerns related to literacy but not directly related to literacy training. Sticht et al. (1971), doing research under HUMRRO work unit REALISTIC, found that printed job materials often had a difficulty level far above the reading ability of even the high aptitude recruit. Sticht et al. (1969 and 1971) also investigated the feasibility of substituting listening for reading in Army training programs. Results indicated that listening is as effective as reading for both average- and low-aptitude personnel although there are many individual differences. It should be noted that emphasis on listening as opposed to reading is inherent in the two approaches singled out in the previous training research section; i.e., the portable audio-visual device for presentation and the peer instructional model.

There is, at the present, no escape from the problem of poor reading skills. Approximately 14,000 DoD accessions received remedial reading training during 1974. From the rate of flow of manpower into this program under favorable recruiting conditions, it appears that functional illiteracy will continue to be a problem far into the future.

TEST DEVELOPMENT

Over the past few decades, manpower managers in large organizations have become increasingly dependent upon the use of written aptitude and proficiency tests for information on their personnel. This is particularly true in the military service. Classification and selection tests (now the Armed Services Vocational Aptitude Battery) provide the data which guide or direct many of the decisions made on an individual from application for entry through completion of training.

The impact of selection and classification aptitude test scores is pervasive, and, indeed, in many occupational specialties and for many personnel, these scores provide reliable guides for initial assignment and other personnel actions. However, there are some situations and people for which test scores do not provide the expected predictive efficiency. This is particularly true for some of those with lower literacy levels, lower aptitudes, or different cultural or language backgrounds, and for those who simply have problems responding to written tests.

It appears that in some cases, test performance is influenced to a degree by non-relevant elements such as literacy and language factors. The acceptance of New Standards recruits, some of whom performed very successfully but whose over-all failure rate in training and on the job was greater than that of higher aptitude groups, focused attention on the need to develop tests less reliant on language skills or educational achievement.

The Navy undertook a vigorous effort to develop and evaluate a number of non-verbal tests. More than 20 such tests were assembled and administered to a population of recruits by the Naval Personnel and Training Research Laboratory and an on-the-job follow-up was conducted. A comparison of the non-verbal tests with the operational classification tests indicated that a few of the non-verbal tests did contribute unique variance to the prediction of the criterion. In no instance, however, did the non-verbal tests equal the operational test battery in predictive efficiency. On the cross-validation analysis, it was estimated that the non-verbal tests contributed a maximum of .07 or .08 to a predictive composite (Cory, 1976).

Wilbourn and Guinn (1973) used a battery of 11 experimental non-verbal tests, administered to a population of 2,362 basic airmen assigned to seven technical schools, in an effort to find dimensions which would improve the assessment of personnel at various aptitude levels. Five of the schools had large enough Category III and IV populations to separate them for individual analysis. This research found that the non-verbal tests added significantly to the prediction of final school grades in each of the seven technical schools. However, when only the lower aptitude sample was analyzed, small but significant validities were obtained for only three of the five technical schools.

There are some indications in the data that some of the non-verbal tests improve the prediction of performance to some degree. However, the evidence appears to support a position that the prediction is improved for the higher aptitude personnel more than for the low-aptitude personnel. The problem of improving assessment for the low-aptitude person remains as difficult as ever. Much of the data from the Navy studies is still in preparation for publication. However, a personal communication from one of the investigators, Dr. Charles H. Cory, expressed the belief that the development of improved aptitude metrics with validities higher than the present verbally loaded test batteries for any group will be very difficult to achieve. He reasoned that "because of the extensiveness of the literature search carried out for the present research, it seems unlikely that promising paper-and-pencil tests which offer potential improvement in ability to identify capable Mental Group IVs have been overlooked. The most reasonable

conclusion is that substantial breakthroughs in the use of paper-and-pencil methodology to identify with any great accuracy the lower mental ability personnel who could be useful is unlikely. Future development of computerized measurement of abilities together with branching test construction might provide an accurate and convenient method of identifying these personnel. However, for several years, the classification tests used operationally are likely to remain the best instruments for screening these personnel."

POST SERVICE ADJUSTMENTS

One of the original justifications for the change of induction standards for military service under Project 10,000 was that many of those affected would benefit in their post-service life from the intensive training in a highly structured environment. With little hard data available concerning the influence of a tour of military service on post-service adjustment, this proposition is little more than a hypothesis.

The assumption implicit in this position is that the DoD is a participant in and an influence on the development and maturation of those who enter the military service in their late teens. These youths are in a very formative period of their life during which their values and aspirations regarding an occupation, education, and personal life style are solidifying. Only a few rigorous studies have been performed on the general effects of a military tour on the large segment of the adult male population which has served in the military service.

The studies by Buesse (1972a and 1974) on the post-service adjustment of Category IV personnel using a carefully selected experimental group of new mental standards servicemen and a control group of civilians carefully matched by aptitude, age, geographic location, and other variables have a solid experimental basis for deriving credible inferences regarding differences between the two groups. Differences between the groups which appear in the analysis probably represent real differences attributable to the effects of a tour of military service on the adjustment pattern of the experimental group to civilian life.

The fact that the experimental group, even after losing two years in the military service had (1) higher aspirations for education and training, (2) higher paying jobs, (3) more geographic mobility, and (4) higher skilled occupations indicates that the time spent in the military service had beneficial developmental influences on the group.

The data support the contention that for the lower aptitude personnel, a tour in the military service has a positive effect upon later civilian adjustment.

SECTION TWO: ANNOTATED BIBLIOGRAPHY

INDEX

The contents of this bibliography are listed below by author, title, and publication in the same order as they occur in the text.

Number		Page
1.	Anderson, A.V., Saylor, J.C., Bilinski, C.R., and Standlee, L.S. <u>Fleet follow-up on Group IV graduates of A schools.</u> Research Report SRR-70-12. San Diego, Calif.: Naval Personnel and Training Research Laboratory, October 1969.....	28
2.	Beusse, W.E. <u>Prediction of participation and achievement in the USAFI GED program.</u> AFHRL/MD-TRM-23 (OASD/M&RA-MR-72-2). Alexandria, Va.: Air Force Human Resources Laboratory, October 1972.....	29
3.	Beusse, W.E. <u>Analysis of survey findings concerning the USAFI high school GED program.</u> AFHRL-TR-73-64 (OASD/M&RA-MR-73-2). Alexandria, Va.: Air Force Human Resources Laboratory, December 1972.....	30
4.	Beusse, W.E. <u>In-service and post-service benefits of GED program participation.</u> AFHRL-TR-73-65 (OASD/M&RA-MR-73-3). Alexandria, Va.: Air Force Human Resources Laboratory, December 1972.....	30
5.	Beusse, W.E. <u>The impact of military service on low aptitude men.</u> AFHRL-TR-74-75 (OASD/M&RA-MR-74-2). Alexandria, Va.: Air Force Human Resources Laboratory, February 1974.....	31
6.	Beusse, W.E. <u>Utilization of Veteran's benefits by Army New Standards FY 1969 separatees.</u> AFHRL-TR-74-74 (OASD/M&RA-MR-74-9). Alexandria, Va.: Air Force Human Resources Laboratory, March 1974.....	33
7.	Boyd, N.K. and Jones, H.H. <u>An analysis of factors related to desertion among FY 1968 and FY 1969 Army accessions.</u> AFHRL-TR-73-63 (OASD/M&RA-MR-73-1). Alexandria, Va.: Air Force Human Resources Laboratory, January 1973.....	34
8.	Cory, C.H. <u>Biographical differences between Navy recruits grouped by mental level, racial identification, and career intention.</u> Technical Bulletin STB 70-2. San Diego, Calif.: Naval Personnel Research Activity, February 1970.....	35

Number		Page
9.	Cory, C.H. <u>A comparison of retention of Category IV's and non-IV's in fifty-eight Navy ratings.</u> Research Report SRR-71-13. San Diego, Calif.: Naval Personnel and Training Research Laboratory, March 1971.....	36
10.	Cory, C.H. <u>A comparison of the Porteus and Navy Maze Tests.</u> Technical Bulletin STE 71-11. San Diego, Calif.: Naval Personnel and Training Research Laboratory, June 1971.....	37
11.	Cory, C.H. <u>A comparison of the job performance and attitude of Category IVs and I-IIIs in 16 Navy ratings.</u> NPRDC TR-76-35. San Diego, Calif.: Navy Personnel Research and Development Center, May 1976.....	38
12.	Cory, C.H. Draft of a technical report, written communication, May 18, 1976.....	39
13.	Cory, C.H., Rimland, B., Thomas, E.D., and Hysham, J. <u>The development and statistical evaluation of a recruit training performance test.</u> Research Memorandum SRM 73-4. San Diego, Calif.: Naval Personnel and Training Laboratory, March 1973.....	39
14.	Department of Defense. <u>Project One Hundred Thousand characteristics and performance of New Standards men.</u> Office of the Secretary of Defense, Assistant Secretary of Defense (Manpower and Reserve Affairs), December 1969.....	40
15.	Drucker, E.H. and Schwartz, S. <u>The prediction of AWOL, military skills, and leadership potential.</u> HumRRO Technical Report 73-1. Alexandria, Va.: Human Resources Research Organization, January 1973.....	41
16.	Federman, P.J., Lautman, M.R., and Siegel, A.I. <u>Factors involved in the adjustment of low aptitude personnel to the Navy and their use for predicting reenlistment.</u> Wayne, Penn.: Science Center, Applied Psychological Services, Inc., August 1973.....	42
17.	Fisher, A.H., Jr. <u>Army "New Standards" personnel: Relationships between literacy level and indices of military performance.</u> AFHRL-TR-71-12. Alexandria, Va.: Manpower Development Division, Air Force Human Resources Laboratory, April 1971.....	43

Number		Page
18.	Fisher, A.H., Jr. <u>Army "New Standards" personnel: Effect of remedial literacy training on performance in military service.</u> HumRRO Technical Report 71-7. Alexandria, Va.: Human Resources Research Organization, April 1971.....	45
19.	Fites, J.B. and Beusse, W.E. <u>Participation and achievement in the USAFI high school GED program.</u> AFHRL/MD-TRM-24 (OASD/MARA-MR-72-2). Alexandria, Va.: Air Force Human Resources Laboratory, September 1972.....	45
20.	Goffard, S.J., Showel, M., and Bialek, H.M. <u>A study of Category IV personnel in basic training.</u> HumRRO Technical Report 66-2. Alexandria, Va.: Human Resources Research Organization, April 1966.....	46
21.	Greenberg, I.M. Project 100,000: The training of former rejectees. <u>Phi Delta Kappan</u> , 1969, 50, 570-574.....	47
22.	Greenberg, I.M. Training and utilization of low-aptitude men in the Armed Forces. <u>Operations Research Applications in the Social Sciences</u> , Summer 1974, 1, 23-29.....	48
23.	Grimsley, D.L. <u>Acquisition, retention, and retraining: Training Category IV personnel with low fidelity devices.</u> HumRRO Technical Report 69-12. Alexandria, Va.: Human Resources Research Organization, June 1969.....	49
24.	Grunzke, M.E., Guinn, N., and Stauffer, G.F. <u>Comparative performance of low-ability airmen.</u> AFHRL-TR-70-4. Lackland AFB, Texas: Personnel Research Division, Air Force Human Resources Laboratory, January 1970.....	50
25.	Hooprich, E.A. <u>A second investigation of the feasibility of Navy Commissaryman training for Group IV personnel.</u> Research Report SRR 68-23. San Diego, Calif.: Naval Personnel Research Activity, May 1968.....	51
26.	Hooprich, E.A., and Matlock, E.W. <u>An investigation of the feasibility of Navy Shipfitter training for Group IV personnel.</u> Research Report SRR 69-4. San Diego, Calif.: Naval Personnel Research Activity, August 1968.....	52
27.	Hooprich, E.A. and Matlock, E.W. <u>Printed-circuit-board soldering training for Group IV personnel.</u> Research Report SRR 71-11. San Diego, Calif.: Naval Personnel and Training Research Laboratory, October 1970.....	53

Number		Page
28.	<u>Hooprich, E.A. and Steinemann, J.H. An investigation of the feasibility of Navy Commissaryman training for Group IV personnel.</u> Research Report SRR 68-7. San Diego, Calif.: Naval Personnel Research Activity, September 1967.....	54
29.	<u>Katz, A., and Goldsamt, M.R. Assessment of attitudes and motivations of Category IV marginal personnel.</u> WRR 72-1. Washington, D.C.: Naval Personnel Research and Development Laboratory, August 1971.....	54
30.	<u>Main, R.E. Development and evaluation of an experimental course in applied mathematics for Group IV personnel.</u> Research Report SRR 70-8. San Diego, Calif.: Naval Personnel and Training Research Laboratory, September 1969.....	55
31.	<u>Main, R.E. The effectiveness of flash cards in a mathematics self-study course for Group IV personnel.</u> Research Memorandum SRM 70-20, San Diego, Calif.: Naval Personnel and Training Laboratory, June 1970.....	56
32.	<u>Mayo, C.C. A method for determining job types for low aptitude airmen.</u> AFHRL-TR-69-35. Lackland AFB, Texas: Personnel Research Division, Air Force Human Resources Laboratory, November 1969.....	57
33.	<u>Mayo, G.D. Fleet performance of Project 100,000 personnel in the Aviation Structural Mechanic 5 (Structures) Rating.</u> Research Report SRR 69-17. San Diego, Calif.: Naval Personnel Research Activity, February 1969.....	57
34.	<u>McFann, H.H. HumRRO Research on Project 100,000.</u> Professional Paper 37-69. Alexandria, Va.: Human Resources Research Organization, December 1969.....	58
35.	<u>McGoff, R.M. and Harding, F.D. A report on literacy training programs in the Armed Forces.</u> AFHRL-TR-73-69 (OASD/M&RA-MR-74-6). Alexandria, Va.: Air Force Resources Laboratory, April 1974.....	58
36.	<u>Montague, E.K., and Showel, N. A review of combat support training.</u> HumRRO Technical Report 69-19. Alexandria, Va.: Human Resources Research Organization, November 1969.....	60

Number	Page
37. Pieper, W.J., Catrow, E.J., Swezey, R.W., and Smith, E.A. <u>Automated Apprenticeship Training (AAT): A systematized audio-visual approach to self-paced job training.</u> AFHRL-TR-72-20 Lowry AFB, Colo.: Technical Training Division, Air Force Human Resources Laboratory, April 1973.....	62
38. Plag, J.A., Goffman, J.M., and Phelan, J.D. <u>The adaptation of Navy enlistees scoring in Mental Group IV on the Armed Forces Qualifications Test.</u> Report Number 68-23. San Diego, Calif.: Navy Medical Neuropsychiatric Research Unit, September 1967.....	64
39. Plag, J.A., Goffman, J.M., and Phelan, J.D. <u>Predicting the effectiveness of New Mental Standards enlistees in the U.S. Marine Corps.</u> Report Number 71-42. San Diego, Calif.: Navy Medical Neuropsychiatric Research Unit, December 1970.....	65
40. Plag, J.A., Wilkins, W.L., and Phelan, J.D. <u>Strategies for predicting adjustment of AFQT Category IV Navy and Marine Corps personnel.</u> Report Number 68-28. San Diego, Calif.: Navy Medical Neuropsychiatric Research Unit, October 1968.....	66
41. Root, R.T., Francis, P.S., and Ray, T.E. <u>Job restructuring within the Navy Hospital Corpsman rating.</u> 4143.11 (Task VI)-F-31. State College, Penn.: HRB-Singer, Inc., July 1968.....	68
42. Sellman, W.S. <u>Effectiveness of experimental training materials for low ability airmen.</u> AFHRL-TR-70-16. Lowry AFB, Colo.: Technical Training Division, Air Force Human Resources Laboratory, June 1970.....	68
43. Standlee, L.S. and Saylor, J.C. <u>Feasibility of Storekeeper Class "A" School training for Group IV personnel.</u> Research Report SRR 68-25. San Diego, Calif.: Naval Personnel Research Activity, June 1968.....	69
44. Standlee, L.S. and Saylor, J.C. <u>Feasibility of Steelworker Class "A" School training for Group IV personnel.</u> Research Report SRR 69-8. San Diego, Calif.: Naval Personnel Research Activity, August 1968.....	70
45. Standlee, L.S. and Saylor, J.C. <u>Second study of Equipment Operator Class "A" School training for Group IV personnel.</u> Research Report SRR 69-19. San Diego, Calif.: Naval Personnel Research Activity, January 1969.....	71

Number		Page
46.	Steadman, J.C., Bilinski, C.R., Coady, J.D., and Steinemann, J.H. <u>The development and evaluation of training methods for Group IV personnel. II. Training Group IV personnel in the operation of the Electronic Multimeter AN/PSM-4.</u> Research Report SRR 69-22. San Diego, Calif.: Naval Personnel Research Activity, March 1969.....	72
47.	Steinemann, J.H. <u>The development and evaluation of training methods for Group IV personnel. I. Orientation and implementation of the Training Methods Development School (TMDS).</u> Research Report SRR 69-12. San Diego Calif.: Naval Personnel Research Activity, October 1968.....	73
48.	Steinemann, J.H., Hooprich, E.A., Archibald, A.G., and Van Matre, N.H. <u>Development of a "Wordsmanship" training course for marginal personnel.</u> Research Report SRR 71-17, San Diego, Calif.: Naval Personnel and Training Research Laboratory, February 1971.....	74
49.	Steinemann, J.H. and Van Matre, N.H. <u>Comparative evaluation of the performance of Group IV personnel in an enlisted skills training course (Lookout and Recognition).</u> Research Memorandum SRM 69-9. San Diego, Calif.: Naval Personnel Research Activity, October 1968.....	74
50.	Sticht, T.G. <u>Learning by listening in relation to aptitude, reading, and rate-controlled speech.</u> HumRRO Technical Report 69-23. Alexandria, Va.: Human Resources Research Organization, December 1969.....	75
51.	Sticht, T.G. <u>Learning by listening in relation to aptitude, reading, and rate-controlled speech: Additional studies.</u> HumRRO Technical Report 71-5. Alexandria, Va.: Human Resources Research Organization, April 1971.....	76
52.	Sticht, T.G., Caylor, J.S., Kern, R.P., and Fox, L.C. <u>Determination of literacy skill requirements in four military occupational specialties.</u> HumRRO Technical Report 71-23. Alexandria, Va.: Human Resources Research Organization, November 1971.....	78
53.	Van Matre, N.H., Harrigan, R.J., and Archibald, A.G. <u>A comparative evaluation of the Group IV personnel assigned to the USS Catskill.</u> Research Report SRR 69-7. San Diego, Calif.: Naval Personnel Research Activity, August 1968.....	79

Number		Page
54.	Van Matre, N.H. and Harrigan, R.J. <u>A comparative evaluation of Group IV personnel assigned to the USS Catskill: Follow-up performance evaluation.</u> Research Report SRR 71-1. San Diego, Calif.: Naval Personnel and Training Research Laboratory, July 1970.....	80
55.	Van Matre, N.H. <u>An Instrument Reading training course for Group IV personnel.</u> Research Report SRR 71-26. San Diego, Calif.: Naval Personnel and Training Research Laboratory, May 1971.....	81
56.	Vineberg, R., Sticht, T.G., Taylor, E.N., and Caylor, J.S. <u>Effects of aptitude (AFQT), job experience, and literacy on job performance: Summary of HumRRO Work Units UTILITY and REALISTIC.</u> HumRRO Technical Report 71-1. Alexandria, Va.: Human Resources Research Organization, February 1971....	82
57.	Vineberg, R., and Taylor, E.N. <u>Performance in four Army jobs by men at different aptitude (AFQT) levels: 3. The relationship of AFQT and job experience to job performance.</u> HumRRO Technical Report 72-22. Alexandria, Va.: Human Resources Research Organization, August 1972.....	84
58.	Vineberg, R., and Taylor, E.N. <u>Performance in four Army jobs by men at different aptitude (AFQT) levels: 4. Relationships between performance criteria.</u> HumRRO Technical Report 72-23. Alexandria, Va.: Human Resources Research Organization, August 1972.....	86
59.	Vineberg, R., Taylor, E.N., and Caylor, J.S. <u>Performance in five Army jobs by men at different aptitude (AFQT) levels: 1. Purpose and design of study.</u> HumRRO Technical Report 73-18. Alexandria, Va.: Human Resources Research Organization, November 1970.....	87
60.	Vineberg, R., Taylor, E.N., and Sticht, T.G. <u>Performance in five Army jobs by men at different aptitude (AFQT) levels: 2. Development and description of instruments.</u> HumRRO Technical Report 73-20. Alexandria, Va.: Human Resources Research Organization, November 1970.....	87

Number

Page

61. Weingarten, K., Hungerland, J.E., and Brennan, M.F.
Development and implementation of a quality-assured,
peer-instructional model. HumRRO Technical Report 69-19.
Alexandria, Va.: Human Resources Research Organization,
November 1972..... 6
62. Wilbourn, J.M., and Guinn, N. Feasibility of using
special measures in the classification and assignment
of lower mental ability airmen. AFHRL-TR-73-31.
Lackland AFB, Texas: Personnel Research Division,
Air Force Human Resources Laboratory, November 1973..... 7

1. Anderson, A.V., Saylor, J.C., Bilinski, C.R., and Standlee, L.S.
Fleet follow-up on Group IV graduates of A schools. Research Report
SRR-70-12. San Diego, Calif.: Naval Personnel and Training Research
Laboratory, October 1969.

This research was initiated to obtain job performance, advancement, and adjustment information on Group IV personnel who had attended Navy Class A schools (rather than on-the-job training) and had subsequently served six months or more on the job. Previous research had indicated successful training of these same Group IV individuals in commissaryman, equipment operator, aviation structural mechanic, shipfitter, storekeeper, and steel worker Class A schools. These earlier research efforts had indicated that Group IV individuals were able to complete Class A training but tended to perform less well than non-Group IV individuals in the academic phases of formalized training.

A nineteen-item questionnaire designed to elicit information relative to work performance, potential, and adjustment was developed and mailed to the duty stations of the Group IV personnel participating in Class A instructional training. Questionnaire data were also obtained on a sample of comparative non-Group IV individuals as a control group. Usable data were obtained on 80 Group IV and 82 non-Group IV individuals. Statistical analysis of resulting data employed the chi-square statistical technique to determine if observed differences were due to chance.

Questionnaire data, provided by supervisory personnel, generally indicated that control personnel were superior to Group IV personnel on a variety of factors. Of the 30 chi-squares computed in evaluating differences between the Group IV and non-Group IV personnel, 13 had values large enough not to be attributed to chance alone. The largest chi-square and smallest extent of overlap occurred in the analysis for achieved pay grade. There were also significant differences between the two groups in relation to recommendation for reenlistment, time to learn job, work quality, work performance, and need for supervision. In all cases, the extent of overlap between the two groups was considerable. The smallest chi-square differences between the groups occurred for items dealing with on-the-job accident rate and how well the men got along with shipmates. The conclusions suggested that Group IV men not be assigned to jobs requiring high level reading or computational requirements and proposed that Group IV personnel would perform more adequately on jobs having a high practical performance content where they would have a longer than average learning period and benefit from greater than average supervision.

2. Beusse, W.E. Prediction of participation in the USAFI GED program. AFHRL/MD-TRM-23 (DAP/NGH 72-1). Alexandria, Va.: Air Force Human Resources Laboratory, August 1972.

In a recent study of participation and achievement of short-term separatees (who entered the service as non-high school leavers) in the US Armed Forces Institute High School General Educational Development (GED) program, Fites and Beusse (1972) found that over 40 percent did not participate in the GED program. It was also found that, of those who participated in the GED program, almost 37 percent failed to achieve high school equivalency. It was felt that the effectiveness of the program could be improved if a reliable method could be developed for identifying those individuals who are not likely to participate or who need more help to pass.

The purpose of the present study is to determine if it is possible to predict (1) whether an individual will participate or not, and (2) whether an individual will be able to pass the GED tests or not on the basis of background characteristics. The data used in this study were drawn from a population of short-term separatees who entered the service as non-high school leavers and separated during the period July 1968 through December 1968. There were 1082 participants and 912 non-participants in the participation analysis sample, and 976 who passed and 174 who failed in the achievement analyses sample. Each sample was then split in half to provide an independent sample upon which the predictive validity of the discriminant functions could be checked. The overall method is discriminant analysis.

The results of these analyses indicate that certain background variables in a discriminant model will effectively identify members of critical groups. This study found that individuals who did not participate in the GED program and individuals who were unsuccessful in passing the GED tests could be identified with a high degree of confidence. Race, AFQT, educational level, marital status, and enlisted/inducted status were the variables used in the participation analysis while only race, AFQT, and education were used in the achievement analysis. The predictive power of the model was the same for both non-participants and for failures.

This study also indicates the potential usefulness of discriminant analysis in other manpower development programs. Discriminant analysis can utilize background information available in the available military records. When used by a trained individual, the managers of manpower development programs can use these criteria. The use of discriminant analysis in manpower development programs may have a number of applications in personnel administration.

3. Beusse, W.E. Analysis of survey findings concerning the USAFI high school GED program. AFHRL-TR-73-64 (OASD/M&RA-MR-73-2). Alexandria, Va.: Air Force Human Resources Laboratory, December 1972. AD-772 680.

This is the third of a series of four studies (all summarized in this annotated bibliography) concerned with the US Armed Forces Institute High School General Education Development (GED) program. Successful completion of the USAFI GED program gave the non-high school graduate a certificate of high school equivalency (frequently bringing very real in-service and post-service benefits).

The purpose of this study is to provide information on factors related to participation in and the successful completion of the GED program. The data for this study were gathered by means of a questionnaire mailed to a sample of recent Army separattees. The sample comprised four groups: those who passed the GED tests at both the DoD level and the level required by their state, those who passed at only the DoD level, those who participated in the program but failed, and those who did not participate.

It was found that servicemen who took the tests early in their military tours were not as likely to pass as those who took them later. However, it was also found that the earlier a serviceman takes the GED tests, the higher his pay grade at separation. Most of the respondents reported that they did not perceive any encouragement to take the tests. Almost four-fifths indicated that their participation was due to their own initiative. Generally, the greater a serviceman's own initiative to take the tests, the better he performed on them. About 48 percent of the participants who responded took some kind of preparatory course. Taking preparatory courses seemed to aid low ability personnel (AFQT Category IV's) in passing the tests while such courses had little or no effect upon higher ability personnel. The respondents reported that personal reasons, such as doubt about ability to pass the tests, were the most important reasons for non-participation. Approximately 17 percent of the non-participants gave lack of information as the reason why they did not participate.

4. Buesse, W.E. In-service and post-service benefits of GED program participation. AFHRL-TR-73-65 (OASD/M&RA-MR-73-3). Alexandria, Va.: Air Force Human Resources Laboratory, December 1972. AD-778 110.

One of the programs offered to servicemen by the Department of Defense (DoD) was the High School General Educational Development (GED) testing program administered by the United States Armed Forces Institute (USAFI). Several million military personnel have

attained high school equivalency by successfully passing the battery of high school GED tests while in the military service. However, little was known about the benefits which accrued to the participants of the GED program.

The intent of this study was to analyze the benefits resulting from GED participation. Both in-service and post-service benefits were considered. The data for this analysis were gathered through use of a survey questionnaire mailed to a sample of former Army personnel. A stratified random sample was selected from each of the following populations: (1) men who had passed the GED tests at both the DoD level and the level required by their home states (N = 668), (2) men who passed the GED tests at the DoD level only (N = 556), (3) men who participated in the GED program but failed (N = 515), and (4) non-high school graduates who did not participate in the GED program (N = 509).

Achievement of GED equivalency was found to result in tangible benefits for the individual while in the military service. Even when aptitude and number of months of active military service are controlled, GED recipients attained significantly higher pay grades than individuals who failed the tests or did not participate.

Attainment of GED equivalency was also found to have a significant impact in the post-service life of the veteran. GED recipients were more likely to be employed in higher paying, more prestigious occupations and to have higher weekly earnings than non-high school graduates who did not receive GED certification. In addition, the state employment offices were more successful in finding jobs for GED holders than for non-high school graduates without equivalency certificates. Contrary to expectations, GED holders did not seem to experience greater ease in obtaining employment than individuals without high school certification although recipients of GED equivalency were found to have higher unemployment rates. This finding was attributed to the GED holders seeking employment in higher level occupations.

The author concluded that the positive relationship between educational credentials and attainment of success in both military and civilian life indicated the importance of the high school equivalency program.

5. Beusse, W.E. The impact of military service on low aptitude men. AFHRL-TR-74-75 (OASD/M&RA-MR-74-2). Alexandria, Va.: Air Force Human Resources Laboratory, February 1974. AD-785 394.

The primary rationale behind the New Standards program was that both the military and the individual would benefit by opening up recruitment to individuals of lower ability. The military would benefit by

being better able to fill manpower needs. The individual would benefit by the opportunity to increase his educational level, learn skills, and acquire working experience.

The purpose of this study was to examine the impact of military service upon the post-service lives of low aptitude men. The data were collected by interview on samples of 477 Army New Standards FY 1969 separatees and 477 Army non-veterans who had been "matched" by race, educational level, age, geographic location, and were within a narrow AFQT range. When the data were checked on these and other background variables, little or no differences were found.

The literature concerning the post-service effects of military service was reviewed with special emphasis being placed upon those aspects which are most likely to have an impact on low aptitude men. Six areas of potential benefit for the servicemen were identified: (1) educational upgrading, (2) skill upgrading, (3) increased geographic mobility, (4) "credentials" effect, (5) improved social adjustment, and (6) a "bridging environment" effect. The review also identified three areas upon which service in the military might have an unfavorable effect upon the veteran's post-service life: (1) health problems, (2) psychological problems, and (3) removal from the labor market for two years.

The results of the data analysis indicate that military service has a positive impact upon the post-service lives of low aptitude men. Compared to their non-veteran twins, it was found that veterans are more likely to (1) complete their high school education or obtain a GED, (2) be employed in the higher skilled, higher paying occupations and industries, (3) have joined a union, and (4) have migrated from the geographical region in which they resided at age 18.

It was also found that veterans earn significantly higher wages than non-veterans. Veterans fared better than nonveterans within each racial-educational subgroup. These income differences were found to be independent of unmatched background characteristics.

On the basis of these results, the author concluded that definite benefits do accrue to the low aptitude man as a result of his military service. Moreover, these are tangible benefits in the form of higher income. Further research is warranted to investigate the ways in which the benefit the veteran derives from his military service can be maximized.

6. Beusse, W.E. Utilization of Veteran's benefits by Army New Standards FY 1969 separatees. AFHRL-TR-74-74 (OASD/M&RA-MR-74-9). Alexandria, Va.: Air Force Human Resources Laboratory, March 1974. AD-785 384.

The purpose of this study was to provide information on the utilization of Veterans' benefits by New Standards separatees. Information was sought concerning their knowledge of their V.A. benefits; past, present, and anticipated use of educational benefits; their need for and use of medical benefits; their use of employment assistance; and their use of other V.A. benefits.

The data were gathered as part of a larger effort aimed at determining the effects of military service on low ability personnel. The 674 subjects came from a stratified random sample of Army New Standards separatees who had entered the service under the reduced mental standards criteria, served for a period of 18 to 24 months, and separated under honorable conditions between July 1968 and June 1969. The interviews were conducted at a point in time approximately two to three years after separation. Detailed breakouts by race, source of accession, and educational level are presented in the body of the report.

It was found that a majority of the veterans reported knowing the benefits to which they are entitled. Almost half indicated they had seen a V.A. representative concerning their benefits.

Twenty-three percent reported having used the G.I. Bill for education. Most attended a private vocational or trade school. Ten percent of the New Standards veterans were still using V.A. support for education at the time of the interview. Two-thirds of them were attending academic programs while the remaining were in some form of job training. Of those veterans who had not yet participated in a V.A.-supported educational or vocational program, 38 percent reported that they plan to use their educational benefits in the future, and another 38 percent were uncertain.

Around 12 percent of the New Standards veterans reported using V.A. benefits for medical care and 11 percent for dental care. About 17 percent of the separatees reported post-service hospitalization, half at a V.A. hospital. Twenty-two percent indicated hospital outpatient care, 42 percent used a V.A. clinic, and six percent used a non-V.A. clinic at V.A. expense.

About 10 percent of the separatees reported using their G.I. benefits for employment assistance, and about half reported getting a job through this program.

Twenty-seven percent purchased a home, 28 percent of whom financed their purchases with a V.A. Home Loan. Eleven percent of the veterans used their G.I. benefits for life insurance.

The results indicate that a majority of the New Standards veterans are aware of and make use of the Veterans' benefits.

Comparable data on other groups of first-term veterans, released during this time, do not exist. However, it appears that increased knowledge of program benefits may lead to higher utilization by NMS separatees.

7. Boyd, N.K. and Jones, H.H. An analysis of factors related to desertion among FY 1968 and FY 1969 Army accessions. AFHRL-TR-73-63 (OASD/M&RA-MR-73-1). Alexandria, Va.: Air Force Human Resources Laboratory, January 1973. AD-772 731.

The purpose of the reported investigation was to determine how well selected background factors distinguish deserters from non-deserters among a selected group of Army personnel and to develop predictive indices of desertion for those factors reflecting backgrounds prior to service entry. A unique feature of this study compared to previous studies is that New Standards personnel were included in this group.

Using information on backgrounds both prior to and during tours of duty, descriptive indices were calculated to compare deserters and non-deserters on selected personal and demographic characteristics. The descriptive comparisons resulted in the following principal findings.

Relative to non-deserters, deserters were:

- less well-educated
- younger at time of service entry
- lower in mental ability (as measured by AFQT scores)
- more likely to have come from the South and Mid-Atlantic states
- more likely to have been Blacks or Others (rather than Caucasians)
- more likely to have been enlistees (rather than inductees)
- more likely to have been in less skilled military occupational specialties
- more likely to have received punishment under the Uniform Code of Military Justice

Predictive indices were computed to obtain estimates of desertion likelihood for prospective personnel. By considering these indices as projected desertion rates, the following major predictions were derived.

The rate of desertion is likely to be higher for:

- non-high school graduates than for graduates
- younger accessions than for older ones
- accessions with lower mental ability than for those with higher mental ability (as measured by AFQT scores)
- enlistees than for inductees
- Blacks than for Caucasians or Others

Further research should be conducted to discover other background factors associated with differential desertion probabilities in the effort to develop a more definitive and qualitative management control measure for identifying potential deserters prior to recruitment. Moreover, those factors already identified should be subjected to more detailed investigation to uncover the underlying reasons which explain their association with desertion proneness.

8. Cory, C.H. Biographical differences between Navy recruits grouped by mental level, racial identification, and career intention. Technical Bulletin STb 70-2. San Diego, Calif.: Naval Personnel Research Activity, February 1970.

This study is part of a larger research effort designed to (a) provide instruments for identifying aptitudes and abilities most useful to the Navy in Mental Level IV personnel and (b) identify the duties that can be successfully performed by these personnel. This report provided an analysis of the responses of Category IV personnel to a biographical information form, developed to predict effectiveness of these men in the Navy.

An experimental U.S. Navy Biographical Information form (BIF) containing 183 items was administered to some 6,190 incoming recruits at the Naval Training Center at San Diego from February to April 1968. The sample upon which the final analysis was based contained 1,150 Category IV and 5,040 non-Category IV personnel. Item responses to the questions of the BIF were correlated with mental level to determine the relationship between various biographical factor areas and aptitude. In addition, subsamples were drawn to compare BIF scores with racial group, reenlistment intentions, desire for jobs of responsibility and attitude towards Navy training. Chi-square was the primary statistical analysis technique employed.

Although many significant relationships were obtained between mental level and biographical factors, the resulting correlation coefficients were generally quite low. Biographical questionnaire responses indicated that the parents of Category IV individuals were less well educated than those of non-Category IV personnel. Employment and income expectations of Category IV personnel were lower than for controls (non-Category IV personnel). Controls were associated more with leadership positions and participated to a greater extent in extracurricular activities than Category IV individuals. With respect to attitude, Category IV individuals more often felt that luck was more important to success than ability. Category IV personnel believed themselves superior in making friends and in appearance factors.

The Black group as a whole showed positive correlations similar to but lower than the total group in the relationship between academic accomplishment, level of employment, and mental level. Most differences accounted for in the Black group were found in the Black controls. The response of the Black control group differed markedly from the White controls. Such factors as stability of the family unit, source of family income, and satisfactory performance and stability in pre-service jobs emerged differentially between the two control groups.

Substantial differences in responses were also found between Category IV individuals who were interested or not interested in reenlistment in the Navy. Category IV's planning to reenlist came from larger families, had not worked as long on the job as other Category IV's in their longest job, composed a larger proportion of non-high school graduates, and saw Navy service as an opportunity for career and training potential more than other Category IV's.

Further research is needed on the BIF in relation to performance to determine the utility of this test in improving prediction of performance. The only content areas that related moderately to mental level were academic interests and performance.

9. Cory, C.H. A comparison of retention of Category IV's and non-IV's in fifty-eight Navy ratings. Research Report SRR-71-13. San Diego, Calif.: Naval Personnel and Training Research Laboratory, March 1971.

The emphasis of this research was to compare the retention rate of Category IV personnel with non-Category IV personnel in a variety of Navy ratings and to identify the ratings for which Category IV individuals might be most suited.

The retention analysis was based on 3,365 men from an original study population of 19,584 individuals who entered the Navy between 1953 and 1965 and were still in the Navy as of 30 June 1967. As AFQT scores were not available for a large portion of the sample, individual AFQT scores were computed from Army Basic Test Battery scores using multiple-linear regression techniques.

Category IV personnel were found in 35 Navy Ratings. The overall retention rate for the entire sample was 18.1 percent. The retention rate of Category IV personnel was found to be lower (12.5 percent) than the percentages for Category I, II, and the high III's (approximately 18 percent). Using the criterion of above average retention level, 12 of the 35 ratings were identified by the authors as appearing to be most suitable for Category IV personnel. These ratings were found to occur in the occupational areas of administrative specialists and clerks, electrical/mechanical equipment repairmen, craftsmen, and service and supply handlers. Other ratings, chiefly in the combat and construction areas, were also suggested as suitable for Category IVs. Since the above findings are based on predicted AFQT scores, they must be considered as tentative, pending replication of the research utilizing actual AFQT scores.

10. Cory, C.H. A comparison of the Porteus and Navy Maze Tests. Technical Bulletin STB 71-11. San Diego, Calif.: Naval Personnel and Training Research Laboratory, June 1971.

The Navy Maze test was designed and intended to be a group administered equivalent of the well known Porteus Maze test. Both maze tests which are non-verbal general aptitude measures were included as part of an extensive development and validation effort to produce classification instruments more useful as predictors of service performance for lower mental category military personnel. This study compares these two tests psychometrically.

The Porteus and Navy Maze tests were administered to 100 (42 Category IV and 58 non-Category IV) Navy male recruits whose scores had been collected on the operational Navy classification tests along with data on several biographic variables. Data from the several variables were intercorrelated and the correlation matrix factored.

Results of the statistical analysis indicated that the Navy Maze test and the Porteus Maze test were measuring different types of skills or abilities. Additionally, results indicated that the Porteus Maze test was inappropriate for mental level individuals

above the Category IV range. The Navy Maze test, however, appears to be measuring skills/abilities not duplicated by the present Navy selection and classification battery, wherefore it may be useful as a predictor of on-the-job performance. At the same time the Navy Maze test results indicated large Black/non-Black differences in mean test scores. Blacks and Category IV individuals tended to perform better (in comparison to non-Blacks and non-Category IV's) on the non-verbal Maze tests than on written verbal tests such as the AFQT and GCT. The author suggested that separate validity studies be conducted for Black and non-Black individuals in the event that the Navy Maze test is considered for use in predicting on-the-job performance.

11. Cory, C.H. A comparison of the job performance and attitudes of Category IVs and I-IIIs in 16 Navy ratings. NPRDC TR 76-35. San Diego, Calif.: Navy Personnel Research and Development Center, May 1976.

This study is a continuation of the large investigative effort begun under Project 100,000. The purpose of this study was to provide objective data on the performance ability of IVs in a representative sample of 16 Navy ratings.

Supervisory evaluations (from a special questionnaire completed by the supervisor as well as the standard Enlisted Performance Evaluation), biographical information, and attitude data (from a self report questionnaire) were collected. For each rating, IVs and non-IVs were compared in terms of job performance and attitudes. Multiple regression analyses were performed on the three ratings with largest sample sizes to predict the performance of Category IVs.

Overall, I-IIIs were superior in terms of time taken to learn the job, amount of supervision needed, confidence of supervisors in their work, and performance on the job. However, for nine of the ratings, the performance of Category IVs did not differ significantly from that of non-IVs. There were relatively minor significant deficits in Category IV performance in four ratings and major deficits in three.

Within the IV category, those performing best tend to be characterized by relatively high scores on GCT, MECH, SHOP, and CLER, and high school completion. In order to bring the performance of IVs up to non-IVs, an additional 40 to 60 percent would have to be rejected for assignment in some of the technical ratings.

Finally, few consistent differences in attitudes were found between IVs and non-IVs. Both found their work interesting and challenging and their supervision pretty good, but felt their Navy jobs would not be helpful to them as civilians.

12. Cory, C.H. Draft of a technical report, written communication, May 18, 1976.

The Navy Personnel Research and Development Center has, over the past few years, carried out a series of studies to develop and validate experimental measures designed to increase the predictive-ness of Navy classification tests for personnel with low mental abilities. This communication details a study (not yet published) in this effort.

Four samples of Navy Category IV recruits were administered sets of experimental tests early in their recruit training. These sets of tests included eight on cognitive skills (mostly non-verbal), four on motivation and perceptual speed (mostly non-verbal), three on vocational interest, and four on experiences, interests, and attitudes. Follow-up studies on on-job performance were conducted near the end of the enlistment period (two years for most). Statistics were computed for a technical and an apprenticeship grouping.

It was concluded that despite an extensive and wide-ranging effort to develop and validate tests which were more appropriate for use in selecting and assigning lower mental ability personnel than operational classification tests, useable results were very meager. In fact, the non-verbal tests generally did not have as much validity for either Lo- or Hi-IVs as the verbally loaded tests in the operational battery.

13. Cory, C.H., Rimland, B., Thomas, E.D., and Hysham, J. The development and statistical evaluation of a recruit training performance test. Research Memorandum SRM 73-4. San Diego, Calif.: Naval Personnel and Training Laboratory, March 1973.

This report describes an attempt to develop a test capable of measuring the achievement of recruits in learning the military/psychomotor skills which occupy a major proportion of recruit training. Such a test would be of special value in assessing the achievement of Mental Category IV personnel who may be penalized by emphasis on verbal/academic testing.

Four forms of the Recruit Performance Test (RPT) were constructed, composed of performance items covering dormitory routine and military drill. The forms were administered under several test-retest schedules ranging from the fourth to the tenth week of basic training. Inter-rater, K-R20, and alternate form reliabilities were performed, and the scores were correlated with the operational selection, classification, and achievement tests.

Despite intensive efforts to develop a wide variety of appropriate test items, the following deficiencies were found: (a) Most recruits performed at a high level rendering the test ineffective for individual discrimination. (b) Although inter-rater reliabilities were satisfactory, K-R20 reliabilities ranged from marginal to low (.76 to .64), and the alternate form reliabilities were unacceptably low. These deficiencies preclude the use of the RPT for comparisons among individual personnel.

14. Department of Defense. Project One Hundred Thousand characteristics and performance of New Standards men. Office of the Secretary of Defense, Assistant Secretary of Defense (Manpower and Reserve Affairs), December 1969.

This study investigated the progress of New Mental Standards personnel in the military services (Army, Air Force, Navy and Marine Corps) who enlisted or were inducted into the military as a part of Project 100,000.

The characteristics of New Mental Standards individuals were compared statistically with control group (non-Category IV) personnel on a variety of demographic and military performance factors. Among these were age, race, education, academic achievement, mental aptitude, pre-service civilian court convictions, home geographic area, basic training performance, grade level achievement, supervisory evaluations, occupational assignment, service offenses, reenlistment, and service attrition. The population sample consisted of 246,000 individuals. Statistical comparisons were composed of simple averages and percentages.

Results indicated that New Mental Standards individuals performed less well on all academic and performance criteria than individuals with higher mental aptitude test scores and educational achievement. However, it was noted that those personnel admitted requiring remedial medical procedures performed as well as the control group on almost all criterion measures.

15. Drucker, E.H. and Schwartz, S. The prediction of AWOL, military skills, and leadership potential. HumRRO-TR-73-1. Alexandria, Va.: Human Resources Research Organization, January 1973.

Recent Army statistics show an increase in the number of soldiers who go AWOL during their military service. To reduce the rate, the Army could reject recruits most likely to go AWOL or could give them special attention. Either solution requires that the soldiers who will go AWOL be identified in advance.

To develop an effective predictive technique, the factors that cause soldiers to go AWOL must first be identified. Once identified, they can be used in a statistical formula to predict AWOL. The factors that were studied to determine their effects on AWOL are personality, attitude toward the Army, career orientation, age, years of education, intelligence, aptitude, race, Army component, and physical status. The ability of these factors to predict Military Skills scores and Leadership Potential ratings also was assessed.

The subjects were 2,072 enlisted men assigned to the United States Training Center, Armor, for basic combat training. Each man completed five scales from the California Psychological Inventory (CPI) and the TA-III Questionnaire, an attitude scale measuring favorability of attitudes toward the Army. Other information for each subject was obtained from personnel records. Subjects were classified as being either AWOL or Non-AWOL during basic combat training and again during initial duty assignment. AWOL and Non-AWOL subjects were compared to determine the relationship between each factor and the tendency to go AWOL. Separate analyses were performed for 17- and 18-year-old soldiers and for soldiers 19 years of age and older during basic combat training.

During both basic combat training and initial duty assignment, AWOL soldiers were found to have less education, lower intelligence, lower mechanical aptitude, and lower clerical aptitude than Non-AWOL soldiers. At both times, the Non-AWOL subjects had the more socially desirable personality traits on the five personality scales. Neither race or physical status was found to be related to AWOL. AWOL and Non-AWOL subjects did not differ in their attitudes toward the Army. Among 17- and 18-year-old soldiers in basic training, those who were AWOL were found to be younger than those who were not AWOL. During initial duty assignment, AWOL soldiers were also younger than Non-AWOL soldiers.

Education, aptitude, intelligence, age, and the Responsibility scale from the CPI were found to correlate highest among the

factors with Military Skills ratings. Race, component, and the four remaining personality scales showed a small correlation with these ratings, while attitude toward the Army, career orientation, and physical status were unrelated to military skills. Subjects with the greatest leadership potential were found to have more socially desirable personality traits than those with low ratings. Those with high ratings were also found to be older, better educated, and more intelligent, and to have higher aptitude scores.

The results of this study suggest that personality is an important determinant of AWOL. Also, soldiers who go AWOL have less education, lower intelligence, and less mechanical and clerical aptitude, and are generally younger than soldiers who do not go AWOL. Race and attitude toward the Army are not important factors. Further, the same factors that cause soldiers to go AWOL also influence acquisition of military skills and leadership potential.

16. Federman, P.J., Lautman, M.R., and Siegel, A.I. Factors involved in the adjustment of low aptitude personnel to the Navy and their use for predicting reenlistment. Wayne, Penn.: Science Center, Applied Psychological Services, Inc., August 1973.

This study represents an extension and elaboration of a set of prior studies and identifies and defines the factors related to the adjustment of Category IV sailors during their first enlistment. Subsequent to the identification of the adjustment factors, the factors were related to the probability that these low aptitude personnel will be recommended for reenlistment and to the probability that they will reenlist. Additionally, this report describes the reactions, attitudes, and perceptions of these personnel to selected aspects of Navy life.

The report is based on the results of questionnaires administered at various points during the enlistment--first week of recruit training (N = 1837), last week of recruit training (N = 1837), one year after entering the Navy (N = 587), and at the termination of a two-year enlistment (N = 391). Factor analysis, multiple discriminant analysis, and cross-lagged correlation analyses were applied to the data.

Approximately one-third of the 1837 low aptitude personnel included in the initial sample attributed their enlistment to the education and training they would receive in the Navy. Other reasons included desire to travel, Naval career, patriotism, postponement of future career plans, and completion of the military obligation. The persons who influenced the low aptitude men to enlist in the Navy were usually the father, mother, and

Navy recruiter. However, approximately one-fourth of the sample were not influenced by any outsiders. One-fourth of the sample, at the beginning of the enlistment, were interested in the possibility of a Naval career. This proportion was increased to 35 percent by the end of recruit training.

The low aptitude sailor indicated that his most important on-the-job needs lie in the social area. Most of the sample claimed that the most important aspects of their job were the kind of people they work with and their supervisor. Next in importance were the aspects of the work itself, such as the specific duties and whether they were interesting and challenging.

The results from four questionnaires were factor analyzed to develop constructs that could be used to describe the low aptitude man. The factors that emerged from the questionnaires were: Perceptions of Navy life, Work and Person Interaction, Supervisory Consideration, Perception of Physical Regimen of Recruit Training, Inducements to Enlist, Preenlistment Employment Record, Encouragement by Others to Enlist in the Navy, Self Realization, Educational Stimulation, Sick Call Treatment, Satisfaction with Rate, Technical Schooling, Affect of Recent Navy Changes, Satisfaction with Superiors, Value Judgments Relative to Navy Life, Facilities for Studying, Evaluation of Navy Life, Interactive Skill Evaluation, General Satisfaction, Time in Rate and Rating, and Watch Schedule.

A set of discriminant function analyses was completed to provide a basis for predicting whether or not a low aptitude man will be recommended for reenlistment and whether or not once recommended for reenlistment, he will reenlist. Quite adequate predictiveness was found by the time that a recruit was at the end of his recruit training.

17. Fisher, A.H., Jr. Army "New Standards" personnel: Relationships between literacy level and indices of military performance. AFHRL-TR-71-12. Alexandria, Va.: Manpower Development Division, Air Force Human Resources Laboratory, April 1971. AD-727 764.

Many New Standards personnel are deficient in literacy to varying degrees. The objectives of this study were to determine the consequences of low literacy on military training, effectiveness, and general suitability for military service. An additional objective was an attempt to predict two-year literacy status on the basis of the individual information available at time of service entry.

In the development of this research, appropriate data were extracted and analyzed from information contained in the Army Project 100,000 computer data file. At the time of study accomplishment, the computer file contained data on 143,000 low mental standard Army personnel as of June 1970. During the course of the study, 2,384 individual data records were examined. Individuals studied were New Mental Standards personnel who had entered the Army from July to September 1967.

At time of entry to Army service, the New Standards men completed a number of tests which measured word knowledge and reading ability. The reading scores on the sample were dichotomized at the fifth-grade level, and the two groups were compared with regard to later military status and performance. Other data included indices of military status and performance evaluations, non-judicial punishment, court-martial convictions, reenlistment eligibility, and type of discharge. Individuals in the sample had served between 22 and 24 months of active duty at the time the research was conducted. Correlation techniques were used to determine the relationship between literacy and performance indicators. An additional portion of the study, an effort to predict literacy status after approximately two years of active service, employed multiple regression techniques.

The statistical analysis indicated no significant relationships between 23-month literacy status and pay grade, conduct ratings, proficiency ratings, number of non-judicial punishments, number of court-martial convictions, or type of discharge.

A significant relationship was found between literacy status and military occupation specialty and reenlistment eligibility. A multiple correlation coefficient of .62 was obtained between 18 predictor variables and the criterion (23-month literacy score). The main predictors were Initial Word Knowledge, Initial Reading Score, Enlistee/Inductee Status, and AQB - GT. The author concluded that literacy is only slightly related to most performance indices but that 23-month literacy status can be predicted reasonably well from pre-service information. In general, for the sample studied (New Mental Standards personnel) literacy status had little or no relationship with most indices of military performance or status. It should be noted that most of the personnel involved in this study were assigned to jobs that did not require high verbal ability.

18. Fisher, A.H., Jr. Army "New Standards" personnel: Effect of remedial literacy training on performance in military service. HumRRO Technical Report 71-7. Alexandria, Va.: Human Resources Research Organization, April 1971.

The relationship was examined between various indices of military performance such as pay grade, military behavior and performance ratings, re-enlistment eligibility and type of discharge and success in remedial literacy training.

Approximately 9,000 individual personnel records were extracted from the Army Project 100,000 data file for evaluation. Individuals whose remedial literacy scores in Army Preparatory Training (APT) reached fifth-grade level were labeled "successful." Those who scored lower than the fifth-grade level at completion of the six week APT course were labeled "unsuccessful."

Various indices of military performance were compared to assess the differences between the successful and unsuccessful groups of Army trainees. Results indicated that successful and unsuccessful Army trainees did not differ greatly in most indices of performance, although "successful" Army trainees were slightly more likely both to achieve a higher pay grade and to be judged eligible for re-enlistment.

Using half of the total group, a multiple regression equation was developed to predict "success" in the literacy training course, based on a variety of test scores and biographical items. The resulting multiple correlation coefficient was .52. Cross-validation on the remaining half of the group produced a multiple correlation coefficient of .50. It is possible to predict post remedial training literacy scores on the basis of information obtainable at the time of entering the service.

19. Fites, J.B. and Beusse, W.E. Participation and achievement in the USAFI high school GED program. AFHRL/MD-TRM-24 (OASD/M&RA-MR-72-2). Alexandria, Va.: Air Force Human Resources Laboratory, September 1972.

The High School General Educational Development (GED) tests measure the extent to which an individual has acquired the equivalent of a general high school education. The results are used to provide evidence of educational achievement for the military and to aid schools, employers, and state departments of education in determining whether the non-high school graduate has the equivalent of a high school education.

The purpose of this report is to provide information on participation and achievement rates in the United States Armed Forces

Institute (USAFI) high school GED testing program which can be used to identify various subgroups of personnel who are not fully being reached by the program. The population consists of 231,973 first-term personnel from all four services who entered the service as non-high school graduates, completed their active duty tours, and separated from the Armed Forces during the period July 1968 through December 1969. Most of these men (69 percent) were 19 or younger at the time they entered the service. Two-thirds had completed at least the 10th grade, and over half had AFQT's below 40. Forty percent of the non-high school graduates were inductees.

Of the 231,973 first-term separatees who had entered service without a high school diploma, 59.4 percent (137,792) had attempted the GED battery during their first tour of service. Of the servicemen who were administered the test battery, 63.2 percent (87,110) achieved the DoD high school equivalency criteria. This means that more than one-third of the first-term separatees who entered service as non-high school graduates attained high school equivalency.

In comparing those non-high school graduate accessions who participated in the GED program with non-participants, it was found that participants (a) were more likely to be enlistees, (b) had higher AFQT's, (c) had more years of formal education, (d) were younger, (e) were assigned to military occupations with higher entry requirements, (f) were more likely to be married, and (g) achieved higher pay grades. No difference in participation rates was found among racial groups when AFQT was held constant.

When men who achieved their GED were compared with those who failed to pass the tests, it was found that those receiving the GED are again best described by the above list (para 4). Also with AFQT held constant, no difference in achievement rates was found among racial sub-groups.

20. Goffard, S.J., Showel, M., and Bialek, H.M. A study of Category IV personnel in basic training. HumRRO Technical Report 66-2. Alexandria, Va.: Human Resources Research Organization, April 1966.

This study was designed to investigate and compare experiences and achievements of Category IV personnel in Basic Combat Training (BCT) with those of non-Category IV personnel. Its more general purpose was to gain insight into the nature and problems of men called marginal.

The background characteristics, experiences, and achievements of Category IV personnel in 22 Army BCT companies were compared

to those of similar personnel with higher AFQT scores. Background information such as test scores, MOS assignments, and leadership potential ratings were gathered from military records, a half-hour interview, and ratings provided by platoon sergeants and senior trainee leaders. The sample population consisted of 243 Category IV men and a matched group of 243 non-Category IV men receiving training at Fort Ord, Fort Dix, and Fort Jackson. Each Category IV man was matched with a non-Category IV man in terms of membership in the same squad, platoon, and Army component. However, they did differ on AFQT scores. Statistical procedures consisted of tests of mean differences in the various behavioral and performance measures.

Results obtained indicated that Category IV trainees as a group scored consistently and slightly lower on most performance measures. They were rated lower both by peers and superiors for leadership potential and achieved a slightly lower mean score on the final Basic Training proficiency test, and more of them failed individually to qualify. However, Category IV's were no more often the objects of administrative or disciplinary actions, and their MOS assignments were similar to those of men in higher categories. Marginal men in general had lower expectations and aspirations for their future life but expressed more favorable attitudes toward the Army. Category IV personnel come from poor social, economic, educational and occupational backgrounds more frequently than non-Category IV personnel.

While there are men in Category IV who lack the aptitude essential to assimilate training and to perform MOS duties satisfactorily, there are many capable of accepting training and performing adequately on the job in a reasonable number of MOS's.

21. Greenberg, I.M. Project 100,000: The training of former rejectees. Phi Delta Kappan, 1969, 50, 570-574.

This article gives manpower demographics of men accepted into the armed services under the Project 100,000 program. It also discusses the military training environment into which the men were sent. The information covers the first 190,000 men accepted and the time period of October 1966 through March 1969. The program eventually included a total of 354,000 accessions and lasted through December 1971.

More than half of the men accepted through March 1969 were volunteers; the remainder were draftees. About 93% entered

under reduced mental standard, the other 7% were volunteers for medically remedial surgery or physical conditioning. Approximately 40% were Black compared to 9% in a control group, 47% were from the South compared to 28% in the control group, only 43% were high school graduates compared to 76% of the controls. The mean score on the Armed Forces Qualification Test was 14th percentile for the Project 100,000 men and 54th percentile for the controls.

In general, the performance of the Project 100,000 men was acceptable. In basic training, 95% graduated compared to 98% for all other men. In occupational training, 10% failed compared to 4% from a control group of men in the same kinds of courses. The Project 100,000 men were assigned to more than 200 different occupational specialties although their AFQT scores kept them out of the more complex jobs.

Project 100,000 men attended the same courses as their more educated peers although many courses were modified to improve their effectiveness for all students. They received the same kind of special tutoring assistance as was available to all students if it was needed. Special remedial reading courses were prepared and made available to non-Project 100,000 men as well as those from Project 100,000.

The additional cost of a Project 100,000 man over his more highly educated peer was only \$200. This included the higher need for remedial reading training, remedial surgery and convalescence, higher attrition in training, and the costs of extra research.

22. Greenberg, I.M. Training and utilization of low-aptitude men in the Armed Forces. Operations Research Applications in the Social Sciences, Summer 1974, 1, 23-29.

This is a brief, overview article on Project 100,000 with emphasis on problems in managing and evaluating the effectiveness of human resource programs.

A short history of Project 100,000 is provided along with a general outline of the evaluation system applied to these recruits. The evaluation system successfully provided general information for top management and Congress, operational information for the program managers, a short- and long-term data base, and a capability for evaluating alternative directions for the program.

In a section on relevancy to non-military programs, several points are elaborated. No lowering of proficiency standards was

required. No segregation into special training camps or courses occurred. The Armed Forces performance oriented vocational courses were easier for these recruits than conventional lecture classes. No special assistance was provided although recycling (repeating earlier sections of a course) was not uncommon. Remedial literacy courses were begun without conclusive evidence of a successful effect on students' careers. Almost all of the New Standards Men were assigned to combat jobs and simple technical jobs such as auto mechanic, cook, or truck driver and had good success in their training courses.

The experience of Project 100,000 suggests that employer-conducted training programs are desirable for low-aptitude men.

A final note elaborates on the definite benefits to the low-aptitude man from his military service.

23. Grimsley, D.L. Acquisition, retention, and retraining: Training Category IV personnel with low fidelity devices. HumRRO Technical Report 69-12. Alexandria, Va.: Human Resources Research Organization, June 1969.

Several studies have shown that low fidelity simulators used in training personnel on procedural tasks can show positive training effects. This study was undertaken for the Army to determine the effectiveness of low fidelity training devices, i.e., relatively inexpensive training devices used in place of actual or real equipment. This research, the third of a series, deals with the effects of low fidelity training devices used in training low aptitude military personnel.

Seventy-two subjects (36 Category IV's and 36 non-Category IV's) were trained individually to operate the Section Control Indicator (SCI) Console of the Nike-Hercules guided missile system. The men were trained on one of three training panels differing in appearance or functional fidelity as follows: (a) an actual working tactical panel of the SCI console, (b) an actual tactical panel but with the absence of electrical power, and (c) an artist's full size color representation of an SCI tactical panel. Each individual was tested immediately after training and approximately four to six weeks later to assess learning and retention. Data were treated statistically by analysis of variance.

Results indicated that low aptitude individuals can be effectively trained using low fidelity training devices. Learning

time was greater for Category IV personnel than for non-Category IV personnel on the training devices. There were no practical differences in performance or retention between the high and low aptitude groups four and six weeks after completion of training.

The effectiveness of low fidelity procedural trainers was demonstrated without loss in proficiency level, training time, memory over time or retaining time, with Category IV personnel.

24. Grunzke, M.E., Guinn, N., and Stauffer, G.F. Comparative performance of low-ability airmen. AFHRL-TR-70-4. Lackland AFB, Texas: Personnel Research Division, Air Force Human Resources Laboratory, January 1970. AD-705 575.

This research was an investigation of the progress and performance of enlistees who had entered the Air Force during the period 8 April 1967 through March 1968 in relation to AFQT Mental Category.

The study compares the performance of 14,215 Category IV and 12,700 higher AFQT Category men on a large number of training and performance factors. These included completion of basic military training, disciplinary actions, unsuitability discharges, academic elimination from technical training, Specialty Knowledge Test performance, promotion, and airman performance ratings. The statistical procedure consisted of application of "chi-square" to determine whether significant differences were present or whether the two groups were essentially equivalent in behavior and performance.

The resulting data indicated that overall, lower mental category individuals (Category IV) were performing at significantly lower levels of proficiency than individuals of higher AFQT categories. Included among the findings were the following: lower mental category personnel had a lower percentage of completion of basic training, more disciplinary actions, more unsuitability discharges, a higher attrition rate from technical training, and a lower percentage attaining the grade of E-3 or higher. Generally, performance of non-high school graduates was lower than that of high school graduates, and Blacks performed less well than Whites on the various performance criteria.

Although the findings of this study indicate that Category IV personnel were performing at a significantly lower level of proficiency than their contemporaries at higher mental levels,

more research is needed to determine whether this will be a continuing trend or whether added job and military experience will bring these men up to higher and more acceptable proficiency levels.

25. Hooprich, E.A. A second investigation of the feasibility of Navy Commissaryman training for Group IV personnel. Research Report SRR 68-23. San Diego, Calif.: Naval Personnel Research Activity, May 1968.

The objectives of this research investigation were to determine the appropriateness of the current Class A commissaryman training for Mental Group IV personnel, to identify training areas requiring course modification, and to compare the course achievement of Category IV and non-Category IV personnel.

The achievement of 14 Group IV personnel was compared with that of 18 regular (non-Category IV) personnel in the formal Navy commissaryman course. Research data were obtained from service records, a pre-training questionnaire, pre-training and course achievement tests, and instructor interviews. Statistical analyses were done on the differences in course achievement of the Group IV and non-Group IV personnel, and the relationship between pre-training variables and course achievement.

Results were similar to those of an earlier study. Despite less relevant civilian experience and poorer reading skills than the regular students in the same class, the Group IV personnel successfully completed the Class A Commissaryman School training. Group IV's, however, did tend to rank lower in the class and required both more instructor-assistance and more individual study. Differences between the two groups were greatest when measured by paper-and-pencil tests, and least noticeable in actual job performance. The only pre-training achievement was reading level. AFQT test performance was neither significantly nor consistently related to course achievement criteria for the Group IV sample.

The authors provided recommendations for modifications in the selection and training of marginally qualified personnel by identifying factors that can enhance achievement in commissaryman training. The authors also provided a comparison between the findings of this second study and a similar study completed earlier.

Insofar as possible, those academic features of the training which cannot be supplanted by laboratory practice of actual jobs and skills should be presented in simplified form to enhance readability.

Follow-up evaluations should be undertaken of the fleet performance of Group IV graduates of Class A schools.

26. Hooprich, E.A., and Matlock, E.W. An investigation of the feasibility of Navy Shipfitter training for Group IV personnel. Research Report SRR 69-4. San Diego, Calif.: Naval Personnel Research Activity, August 1968.

This research investigated the appropriateness of training Mental Group IV personnel in the Class A Shipfitter School course and provided a comparison of course achievement of Category IV and non-Category IV personnel.

The achievement of 14 Group IV personnel was compared with that of 32 regular input (non-Group IV) personnel in the same class at the Class A Shipfitter School. No adjustments were made in course instructional materials or procedures. Statistical analyses were made of the differences between course achievement scores of the Group IV and regular students, and of the relationships between pre-training variables and course achievement criteria. Two questionnaires were administered, one to gather pre-training information and one to determine post-training reactions to the shipfitter course.

The course criteria consisted of written and performance tests administered throughout the course and final course grades based on the written and performance tests associated with the training course.

Results indicated that the regular trainees performed significantly higher than Group IV trainees on pre-training variables and on all course achievement criteria. Differences between the groups were substantially greater when performance was assessed by written tests; however, differences were much smaller although still significant when measured by actual job performance.

All of the regular personnel and 13 of the 14 Group IV individuals completed the 15 week course with a passing final course grade. The AFQT was found not to be significantly related to course achievement for the Mental Group IV individuals.

Selection criteria beyond AFQT score are suggested for use with Group IV personnel, considering that they begin training at a disadvantage because of deficiencies in basic aptitudes and relevant civilian education and experience. Statistical analysis indicates that the Mechanical Test Score of the Basic Test Battery may be significantly related to success in Shipfitter School training.

27. Hooprich, E.A. and Matlock, E.W. Printed-circuit-board soldering training for Group IV personnel. Research Report SRR 71-11. San Diego, Calif: Naval Personnel and Training Research Laboratory, October 1970.

The emphasis of this research was to determine whether Category IV personnel could be taught (within an acceptable period of training) to perform an exacting skill such as printed-circuit-board soldering, and to compare two methods of accomplishing such training.

During the period 1968 to March 1970, 186 Group IV personnel received soldering training as one portion of the Navy Training Methods Development Program. One soldering instruction course was taught by the visually aided method (filmed lessons) and the other by normal classroom instruction using instructor personnel. A soldering achievement test administered prior to and after training was the course achievement criterion. Additionally, course achievement of the Category IV personnel was compared with that of experienced soldering technicians in the fleet. The statistical procedure consisted of analysis of variance.

Results indicated no significant differences in course achievement between instructor-taught and viewer-taught groups. The scores of the Group IV personnel on the soldering test were much higher than the performance scores of 141 experienced technician personnel whose jobs required proficiency in printed-circuit-board soldering.

Although no differences in course achievement between the two course methods was found, researchers noted the advantages of the visually aided training method.

Group IV trainees strongly preferred the visually aided instructional method to the more conventional course instruction.

Group IV personnel can learn the skills for printed-circuit-board soldering to a satisfactory degree of proficiency but based on a related study require twice as much time to acquire the skills as do higher category personnel.

28. Hooprich, E.A. and Steinemann, J.H. An investigation of the feasibility of Navy Commissaryman training for Group IV personnel. Research Report SRR 68-7. San Diego, Calif.: Naval Personnel Research Activity, September 1967.

The purpose of this research was to investigate the effectiveness of training Mental Category IV personnel in the Class A commissaryman training course and compare course achievement of Category IV with non-Category IV personnel.

The study sample included 17 Navy Group IV trainees and 29 regular (non-Category IV) students assigned to Class A Commissaryman School. Research data were obtained from service records, pre-training questionnaires and tests, and interviews. Statistical analyses were done on the relationships between pre-training variables and the criterion variable course achievement.

Results indicated that course achievement of the Group IV individuals was significantly lower than that of regular trainees. The greatest difference in achievement between the two groups was on written paper-and-pencil tests, and least discernible in actual performance test areas. However, all Group IV personnel passed the commissaryman training course. For Group IV personnel, course achievement was significantly related to number of years of education and to reading level, but not to aptitude test performance (AFQT, GCT, etc.).

Efforts that would simplify the vocabulary used in tests and in other written materials, whether in training or on the job, would help to reduce the effects of reading handicaps for Group IV personnel. In subject areas dealing with arithmetic computation, job aids would help to lessen the difficulties found by Group IV personnel in performing these activities.

29. Katz, A., and Goldsamt, M.R. Assessment of attitudes and motivations of Category IV marginal personnel. WRR 72-1. Washington, D.C.: Naval Personnel Research and Development Laboratory, August 1971.

This research was designed to identify the motivational, behavioral, and attitudinal characteristics of Category IV enlisted personnel and to relate these characteristics to Navy success. An additional objective was to determine if "experience" helped prepare Category IV personnel for return to civilian environment.

This report studied the demographic characteristics of 1,837 Category IV Naval enlistees who entered the Navy during February

and May 1970. It also described their attitudes both upon arrival and completion of boot camp by means of a specially developed questionnaire. Of this group 1,340 were upper level and 497 were lower level Category IV personnel. The chi square technique was used to determine whether significant differences existed between the responses of the upper and lower level Category IV groups.

Results indicated that Category IV personnel were generally from large families and disadvantaged socioeconomic backgrounds. Most of their parents held relatively unskilled occupations. Of the subjects, 95 percent were single, 37 percent were non-White, and 82 percent had completed at least nine years of formal schooling.

A primary enlistment motivation was the desire to obtain technical training. The Navy was perceived as a personally rewarding environment, comparing quite favorably to civilian life. Recruits were characterized as liking people, being fairly responsible, self-confident, and self-assertive. Most were satisfied with their treatment and training. However, at completion of boot camp, 23 percent did not receive the general rate apprenticeship for which they felt best qualified, and one-half did not receive the one they wanted.

Comparisons made between upper and lower Category IV personnel in the sample indicated that lower Category IV men were slightly older, were more often Black, and were more often working on a full-time basis prior to service than were the upper level Category IV personnel. Lower Category IV personnel were more satisfied with the various aspects of recruit training than upper level Category IV personnel. More than eight in 10 believed boot camp training would be relevant to their first duty assignment and that they would be able to utilize prior civilian education, training, and/or experience.

30. Main, R.E. Development and evaluation of an experimental course in applied mathematics for Group IV personnel. Research Report SRR 70-8. San Diego, Calif.: Naval Personnel and Training Research Laboratory, September 1969.

This effort describes the development and testing of an experimental mathematical training course for use with Category IV personnel. Course development included the selection of course content, development and evaluation of course materials, and its preliminary implementation. Testing of the course was accomplished with Category IV personnel whose achievement was evaluated.

Forty-eight (48) Navy marginal (Category IV) personnel were exposed to an experimental course in basic applied mathematics. Background data including age, aptitude test scores, and educational level were collected and evaluated. Instruction was accomplished with self-study materials and the group was divided into three classes of 16 Category IV personnel per class. In addition to the self-study course materials, the students of two classes were supplied with decks of flash cards for additional study use. The USAFI III Arithmetic Computation Test and the Arithmetic Operations Quiz were administered prior to and at the completion of the course to measure course achievement. Pre-test, post-test differences were analyzed statistically to determine whether any of the gains were significant.

The results indicated that the course had increased the Category IV mathematical achievement level significantly for two of three classes. There was no significant difference in the mathematical achievement of trainees whether or not they used the flash card supplements. It was noted that Category IV personnel do not compose a homogeneous group with identical training needs in mathematics. Of special interest among the findings was the need for maintaining a high level of classroom motivation as a means for influencing learning.

31. Main, R.E. The effectiveness of flash cards in a mathematics self-study course for Group IV personnel. Research Memorandum SRM 70-20, San Diego, Calif.: Naval Personnel and Training Laboratory, June 1970.

The present research is an effort to evaluate the effectiveness of flash cards in a basic mathematics self-study course for Category IV personnel. This effort was a repeat of an earlier study.

Sixteen Navy Group IV personnel enrolled in a basic arithmetic training course were given additional training with flash cards. The primary training course was a self-study program instructing individuals in the use of mathematics. The USAFI III Arithmetic Computation Test and the Arithmetic Operations Quiz (AOQ) were administered prior to training and at course completion to evaluate achievement. The statistical treatment consisted of an evaluation of achievement test scores to determine their significance, together with analysis of variance to test for main effects.

Results indicated that students performed at a significantly higher level on both the USAFI III and the AOQ tests upon completion of the course. The additional flash card training, however, provided no significant gains in learning beyond the primary course instructional materials.

32. Mayo, C.C. A method for determining job types for low aptitude airmen. AFHRL-TR-69-35. Lackland AFB, Texas: Personnel Research Division, Air Force Human Resources Laboratory, November 1969. AD-700 747.

This research was undertaken to develop methods to identify tasks and job types for lower mental aptitude personnel in the Air Force. The study utilized an opinion survey as a method in identifying those tasks and job types within 11 Air Force career areas for which the aptitude requirements were thought to be relatively low.

Technical advisors in the field were asked to identify those tasks which could be performed effectively by low aptitude personnel. Tasks which 25 percent of the sample of technical advisors agreed to be low aptitude tasks were then submitted to technical training instructors for ratings on nine evaluative factors. The nine factors were: amount of supervision required, training, thought required, non-routineness, changes, danger, knowledge, expense, and non-repetitiveness. Low aptitude tasks were identified in 10 of the 11 career ladders.

According to the raters, low aptitude tasks were characterized much more by the possibility of danger, changes, and expensive errors than they were by the need for knowledge, training, or supervision. Most advisors felt that career advancement would be necessarily limited to the apprentice and journeyman skill levels, that extra training and supervision would be required, and that special knowledge, abilities and personal characteristics would be necessary for the success of Category IV personnel. Strengths and weaknesses of the methodology for discovery of low aptitude job types are discussed. A positive aspect of the methodology was seen in the ease with which the tasks tests were constructed. The method was also sensitive to rating contradictions, and in that sense provided a cross-check within the system. However, a weakness in methodology was the lack of control for systematic rater bias.

33. Mayo, G.D. Fleet performance of Project 100,000 personnel in the Aviation Structural Mechanic S (Structures) Rating. Research Report SRR 69-17. San Diego, Calif.: Naval Personnel Research Activity, February 1969.

This study investigated the performance of a sample of Project 100,000 Category IV personnel in the Navy Aviation Structural Mechanic (S) rating.

Performance, as measured by supervisor evaluations of 30 Navy Project 100,000 personnel in the Aviation Structural Mechanic

(AMS) rating, was compared with the evaluations of a sample of regular input personnel. Losses of subjects, due to a variety of causes, depleted the size of the experimental sample to 13 on whom complete data were available. Fleet experience for each subject was approximately seven months. Test of means (t test) was computed to determine performance differences between the Project 100,000 men and those of the regular input sample.

Project 100,000 subjects exhibited a wide range of performance scores, as evaluated by supervisory ratings, from well above average to unsatisfactory. Generally, the performance of the Project 100,000 subjects was rated at a significantly lower level than regular personnel. The study did not provide a means for predicting in advance which Category IV personnel would perform well and which would not. The author concluded that the results of this study indicate that training marginal personnel in the AMS rating is not in the best interest of the Navy, unless dictated by a manpower shortage or by non-military considerations.

34. McFann, H.H. HumRRO Research on Project 100,000. Professional Paper 37-69. Alexandria, Va.: Human Resources Research Organization, December 1969.

This descriptive report presents the general research plans and some research findings of HumRRO research associated with Project 100,000. The primary research objectives of these projects were to determine the impact of lower mental ability personnel on Army training and performance and to ascertain the relationship between measured aptitude and performance in both training and "on-the-job" environments.

The report was presented at the American Psychological Association Convention as part of a symposium entitled "Project 100,000 and Research on Lower Ability Personnel." The presentation incorporated findings and research plans of HumRRO work units SPECTRUM, APSTRAT, REALISTIC and UTILITY.

Research conducted under these studies is described elsewhere in this bibliography.

35. McGoff, R.M. and Harding, F.D. A report on literacy training programs in the Armed Forces. AFHRL-TR-73-69 (OASD/M&RA-MR-74-6). Alexandria, Va.: Air Force Human Resources Laboratory, April 1974. AD-781 366.

Many young men entering military service possess poorer reading skills than are required for adequate performance in many military

situations. This is particularly true of those who scored below 31 on the AFQT. To help them to adapt more successfully to military training and other requirements, each service has organized some form of a literacy training program to raise reading skills to a predetermined level.

The purpose of this study was to describe literacy training programs in the military services as they existed in the summer of 1971 and to develop suggestions for more effective training. The information presented was collected during visits to all the literacy training programs in the Air Force and Navy and five of the Army's programs. The data were obtained through questionnaires and interviews, examination of educational records and instructional materials, and observation of the instructional process.

Based upon the data collected during the visits, a comparative description of the remedial reading programs of each of the services was developed as follows:

1. The Air Force aims at a sixth grade reading level while the Army and Navy seek a fifth grade level.
2. The Air Force and the Army routinely gave a reading achievement test to low scorers on the AFQT. Two of the Navy installations waited for evidence of lack of progress in boot camp. Of the resulting trainees in the literacy training program, three-fourths had AFQT scores below 20, and 43 percent had graduated from high school.
3. Instructional methods and techniques are quite varied among the service literacy programs depending upon the trainee's needs and the instructor's preferences.
4. Approximately two-thirds of the students achieve the desired reading levels. On the average, the Air Force students who are required to reach a higher reading level spend twice as much time in remedial reading training as do their counterparts in the Army and the Navy.

The authors suggest that literacy training should include job related materials and skills, and, in fact, that the individuals in the program be identified more by poor performance in military training than on performance on reading tests. In addition, when diagnostic tests are used, they should be uniform across all programs. Indeed, it is suggested that the differences in program objectives, training methods and materials, and evaluation

procedures be investigated with a goal of incorporating the best features of all the Services' programs.

The description of the Services' literacy training programs raised a number of management questions for which little information was available. A prologue written as a separate part of the study provided a review of the research literature and discussed management considerations. These are:

1. The degree to which literacy level is related to performance in basic military training and to later successful training and performance in an assigned specialty.
2. Whether the skill increase obtained during literacy training is retained over time and useful to the trainee.
3. The adequacy of a fifth or sixth grade reading skill to influence later job performance or to enhance personal satisfaction.
4. The literacy level(s) required for reaching journeymen skill levels in different occupational specialties.
5. The trainability of young adults in the lower aptitude categories to achieve significantly more effective literacy levels.
6. The effect of low reading skills on working relations with supervisors and peers when written directions must be followed.

The need for a more comprehensive effort on these problems is evident in the unanimous recommendation of the Working Group on Listening and Reading in the Armed Services made in November 1970. This recommendation was that "literacy training be designed following a system approach, which would include the thorough assessment of literacy requirements of the various military occupations, the orderly structuring of training programs geared to satisfying the occupational requirements, and, most importantly, well designed evaluative procedures to provide feedback for program improvement."

36. Montague, E.K., and Showel, N. A review of combat support training. HumRRO Technical Report 69-19. Alexandria, Va.: Human Resources Research Organization, November 1969.

The emphasis of this research, a subunit of work done under unit SPECTRUM, was to identify training problems in relation

to a wide range of student mental ability and to propose feasible recommendations to observed problems.

Data were gathered on over 1,300 trainees in 23 classes in eight combat support courses. Student aptitudes, analyses of course content, instructional and evaluational procedures, and student achievement and attitudes were among the data evaluated. Two courses, General Supply and Field Wireman, were selected for further study in depth because of the wide range of abilities of the trainees, the high attrition rates, and the general difficulties that the lower ability students had with these courses.

Similar observations were made and data gathered on the same courses (the basic Clerk course was substituted for the General Supply course at one installation) at three other training centers.

Findings elicited by the research team indicated certain strengths and a number of problems in present combat support training. Strengths were noted in the fundamental training structure and dedication of instructors and administrators. Problems found in common among the training centers were related to practices entrenched in Army Subject Schedules and the difficulties inherent in the very wide range of student ability.

The nature of the training system operates against the less literate trainee and makes very difficult simultaneous handling of Category I and Category IV trainees. The highly verbal training objectives, lecture-type instruction, and heavy use of paper-pencil examinations in these occupational courses make a functional and job related approach to instruction very difficult.

The present attrition patterns indicate much higher levels of recycling associated with low AFQT category. Remedial actions are also highly verbal, involving additional study hours.

The system is not optimally oriented towards handling a wide range of abilities. High-level trainees are not challenged, and low-level trainees cannot cope with highly verbal-academic content. The logical conclusion is to redirect instruction towards job-related objectives, job-type instructional sequences, evaluation of a practical nature, and development of means to fit training to ability level.

Conclusions derived from the findings led to the following implications for prospective improvement of Army training.

- o The role and use of Army Subject Schedules in training need reconsideration. The aim should be towards greater flexibility and adaptability to meet the needs of functionalization of training, individualization of training, and the various modes of programming of instruction.
- o Individualized instruction should be emphasized. Several methods for accomplishing this goal are discussed, including track systems, student tutors, and team training.
- o Verbal instruction, especially platform-centered, should be de-emphasized whenever possible, and practical and functional training increased. Physical and temporal separation of instruction and practice should be minimized, and verbal instruction should be made a greater working adjunct of practical instructions.
- o The role and use of instructional committees should be revised to establish closer and more personal relationships between individual instructors and trainees through longer functional sequences of instruction.
- o Administrative practices should be improved to make training goals and instructor success a key to supervision.
- o Concrete and specific performance standards should be established with an emphasis given to task mastery and leading away from the percentage system of grading.
- o Performance evaluation rather than paper-and-pencil tests should be tried in evaluating the accomplishment of students low in verbal and literacy abilities.
- o Consideration should be given to the use of professional educators as staff advisors to assist with training innovations and changes.

37. Pieper, W.J., Catrow, E.J., Swezey, R.W., and Smith, E.A.
Automated Apprenticeship Training (AAT): A systematized audio-visual approach to self-paced job training. AFHRL-TR-72-20
Lowry AFB, Colo.: Technical Training Division, Air Force Human Resources Laboratory, April 1973. AD-764 818.

This research was initiated to explore the feasibility of designing and using automated audio-visual instructional modules for on-the-job

training. It was believed that success in this area would have significant impact on training policies and personnel utilization.

The Automated Apprenticeship Training (AAT) method is a systemized audio-visual approach to self-paced job training which employs an easily operated, portable and reliable teaching device. Job performance is emphasized over job knowledge, and audio-visual skills are emphasized over reading-writing skills. For this effort AAT courses were designed for two specialties of the Air Force security police career field. Lessons were presented individually on Audiscan I Model A teaching devices-which used a film strip and tape packaged in a single cartridge. The narration and an accompanying workbook were at a sixth grade reading level.

A group of sixty AAT students were compared with sixty students from a technical training Airman Basic Resident (ABR) course and with sixty students trained on the job through a Career Development Course (CDC). Category IV airmen made up one-half of each group of sixty trainees and higher aptitude airmen made up the remaining half. The three groups were compared on a job performance test and on supervisors' ratings after they had approximately two months work experience. AAT and CDC students were also compared on a job knowledge test administered at the completion of training. In addition, trainee and supervisor man-hours were investigated. The statistics employed included Hartley's F max, omega squared, Scheffe test for multiple comparisons, and the Kruskal-Wallis analysis of variance by ranks.

The high and low aptitude AAT trainees performed as well respectively on the job performance test as the high and low aptitude ABR trainees, and both these groups performed better than the CDC trainees. There was no significant difference between the AAT and CDC students on the job knowledge test. Also the three groups did not differ on supervisors' ratings. The AAT course gave a 25 percent saving in trainee man-hours and a 60 percent saving in supervisor man-hours over the ABR and CDC courses.

Use of the AAT approach can produce on-the-job training graduates similar to technical school graduates in job performance ability and, at the same time, save considerable man-hours for both trainees and supervisors. This holds true for Category IV airmen as well as higher aptitude airmen.

38. Plag, J.A., Goffman, J.M., and Phelan, J.D. The adaptation of Navy enlistees scoring in Mental Group IV on the Armed Forces Qualification Test. Report Number 68-23. San Diego, Calif.: Navy Medical Neuropsychiatric Research Unit, September 1967.

The purpose of this report was to present the findings of a study designed to evaluate differences in the adaptation of "average" and mentally marginal Navy personnel during their first Navy enlistment and to determine the validity of pre-service factors for predicting overall Naval effectiveness for Category IV personnel. This particular phase of investigation was aimed at the construction of tables that could be used by recruiting officers to ascertain the chances for effective service performance by mentally marginal applicants possessing certain pre-enlistment characteristics. During their first enlistment, performance and adjustment data were gathered for approximately 1,760 Navy personnel, 1,260 of whom were Category IV individuals. The criterion, Naval effectiveness, was defined as completion of a tour of duty plus a recommendation for reenlistment. Statistical analysis consisted of tests of differences of means, employing the chi square technique and multiple regression analysis.

Results of the analysis suggested that approximately 65 percent of the Category IV enlistees were found to be effective sailors, although their performance was significantly less satisfactory than that of the comparison group (whose average AFQT score was at the 50th percentile), particularly in criterion measures in which cognitive abilities play an essential role. On one factor of adjustment to the Naval service, Category IV personnel had no higher rates of courts-martial action than the control group.

Four pre-enlistment characteristics of Category IV enlistees were found to be predictive of four-year effectiveness. They were (a) years of schooling completed, (b) number of expulsions and suspensions from school, (c) AFQT score, and (d) number of arrests (pre-service). The cross-validation of the predictor composite was found to be a correlation coefficient of .31.

A probability table was derived showing the odds for effectiveness of enlistee applicants on the basis of different combinations of the four significant predictors. These data can be utilized by the Navy for enlistment selection of Category IV applicants whose pre-service records indicate the highest chances of becoming effective sailors.

39. Plag, J.A., Goffman, J.M., and Phelan, J.D. Predicting the effectiveness of New Mental Standards enlistees in the U.S. Marine Corps
Report Number 71-42. San Diego, Calif.: Navy Medical Neuropsychiatric Research Unit, December 1970.

This study had two objectives: (a) to ascertain whether differences existed in military effectiveness between New Mental Standards (NMS) accessions and non-New Mental Standards enlistees in the U.S. Marine Corps; and (b) to identify characteristics of the New Mental Standards men which are related to service adjustment and could be used for selecting those applicants most likely to perform effectively.

The research sample consisted of 3,156 NMS Marine Corps accessions and a group of 240 non-NMS enlistees. All subjects were two-year enlistees. Two control groups were organized: Control Group I consisting of all non-NMS Marines and Control Group II consisting of a distribution of the same men according to the distribution of AFQT scores from which a selection was made to approximate the distribution of all non-NMS accessions during a six-month period when the NMS group was enlisted.

Performance of each subject was measured on a variety of factors such as attrition, recommendation for reenlistment, court-martial action, pay-grade, etc. Based on his performance, each Marine was classified as having given effective or non-effective service. Non-effectiveness was defined as a composite of criteria: non-recommendation for reenlistment; early discharge; or being unable to meet acceptable performance levels measured by court-martial action, pay grade, number of office hours (non-judicial punishment), average conduct mark, or average proficiency work.

Differences on many of the criterion measures between the NMS accessions and the higher mental ability enlistees were sizable. In all cases, differences favored enlistees of higher mental ability. Attrition during the first year of service was considerably higher for the NMS enlistees (14 percent) than it was for Marines of higher mental ability (8 percent). The most impressive difference between the two groups occurred on the measure of non-effectiveness. New Mental Standards Marines had a rate of non-effectiveness amounting to 39 percent, while the figure for enlistees with higher mental abilities was only 25 percent.

Of all the pre-enlistment and recruit training variables which were correlated with service effectiveness, only a relatively few were found to be predictively valid. These were years of

schooling completed, average AQB score, parents' marital status, age at enlistment, race, and average aptitude test score. Variable composites, derived at three different time periods, were found to have predictive validities ranging between .21 and .25. On the basis of these predictor composites, tables of odds for effectiveness scores were constructed for the possible use of Marine Corps recruiters and recruit training administrators. Assuming a favorable selection ratio, it was estimated that a significant improvement could be made in the percentage of NMS Marines who would render effective service performance if odds for effectiveness scores were utilized as a basis for selection.

40. Plag, J.A., Wilkins, W.L., and Phelan, J.D. Strategies for predicting adjustment of AFQT Category IV Navy and Marine Corps personnel. Report Number 68-28. San Diego, Calif.: Navy Medical Neuropsychiatric Research Unit, October 1968.

This research was initiated to evaluate the adaptation of AFQT Category IV enlistees by exploring new techniques for increasing their trainability and evaluating devices for selecting those Category IV personnel with the best chances for making a satisfactory service adjustment. Both performance and adjustment problems of Category IV and non-Category IV personnel were compared, and, through the use of pre-service characteristics, a predictor device for the prediction of adjustment of Category IV and Navy and Marine Corps personnel was developed.

Twelve hundred and sixty (1,260) Navy enlistees with AFQT percentile scores between 16 and 30 and 733 Marine enlistees with AFQT scores between 20 and 30 were selected from a larger population and evaluated on various performance measures throughout their four-year enlistment periods. The performance of Category IV individuals was compared with that of a sample of individuals with average AFQT scores (approximately the 50th percentile). For the prediction portion of the study, the effectiveness criterion was defined as completion of an enlistment period plus recommendation for reenlistment. Statistical procedures included comparison of means for significant differences and multiple regression analysis. Performance was measured at three periods - during recruit training, at the end of two years of active service, and at the end of the first enlistment, i.e., at the end of four years. Results indicated that Category IV enlistees were inferior to average enlistees on a variety of measures of military adaptation which included disciplinary measures; unfitness, unsuitability, and misconduct discharges; conduct and proficiency marks in basic training; pay grade; admission to sick lists; completion of tour;

and recommendation for reenlistment. These differences occurred at all three stages at which measures were taken. Many Category IVs, however, were able to render effective military service. Sixty-five percent of the Category IV sailors and 73 percent of the Category IV Marines both completed their initial enlistments and were recommended for reenlistment, compared with 75 percent and 85 percent of their respective average mental ability counterparts. These differences were found to be statistically significant.

Additional studies examined illness rates as a factor contributing to adjustment for the complete population at the conclusion of their initial enlistment. In the case of the Navy men, there was no difference in the incidence of physical or psychiatric illnesses, but Category IV men had a greater sick-list admission rate for venereal infection. Among the Marines, just the opposite occurred in that Category IV personnel had a greater frequency rate for both physical and psychiatric illness, but no difference in the incidence of venereal disease. Although a high percentage of Category IVs performed effectively, there is no question but that Category IVs do not adapt as well to military service as do the "average" controls.

For Navy personnel, the four pre-enlistment variables most predictive of "effectiveness" were years of school completed, number of expulsions or suspensions from school, AFQT test performance, and number of civilian arrests. The multiple correlation coefficient for these variables was .31 in a cross-validation sample.

For Marine personnel, the four pre-enlistment variables most predictive of "effectiveness" were years of schooling completed, religion, dating frequency, and age. The multiple correlation coefficient for these variables was .30 in a cross-validation sample.

Civilian educational achievement was found to be the best single predictor of 4-year military effectiveness of all biographical characteristics studied, verifying earlier research both in the Navy and Air Force. The difference between Category IV Marines' and Category IV sailors' "effectiveness rates" was noted, but it was hypothesized that the difference was attributable to differences in personnel and administrative policies rather than to differences in the calibre of enlisted input.

41. Root, R.T., Francis, P.S., and Ray, T.E. Job restructuring within the Navy Hospital Corpsman rating. 4143.11 (Task VI)-F-31. State College, Penn.: HRB-Singer, Inc., July 1968.

The emphasis of this research was given to a feasibility study to determine whether, as a result of job restructuring (modifying the job to fit the man), Mental Category IV personnel could perform effectively as Hospital Corpsmen under the Navy Hospital Corpsman Rating. A second effort was the identification of tasks for possible job restructuring to permit effective utilization of marginal mental personnel.

Thirty-one marginal ability personnel with a high school education or special aptitudes (as measured by the Basic Test Battery) were admitted to Hospital Corpsman training. Their performance was compared with 30 trainees in higher AFQT categories on a knowledge retention test, a task performance scale, and an overall work evaluation scale.

Results indicated that lower mental category personnel had more difficulty in training as evidenced by their disenrollment rate from the formal training program and by poorer performance on the knowledge retention test. Observed differences were not extremely large, and only in some cases were the differences statistically significant. Actual on-the-job performance and performance evaluation ratings of the Category IV individuals were no different from those of the non-Category IV personnel.

The effort directed toward identification of job tasks which could be restructured to permit effective utilization of marginal personnel resulted in identification of two task or job clusters; one set involved tasks related to activities on the hospital ward, the other set was comprised of tasks across five hospital areas - operating room, clinical laboratory, neuropsychiatry, x-ray, and physical therapy environments. The former cluster may be compared to the job of hospital orderly in a civilian hospital; the second cluster does not have a civilian analogy but indicates the potential for a low-level position cutting across conventional boundaries for personnel with minimal experience and training.

42. Sellman, W.S. Effectiveness of experimental training materials for low ability airmen. AFHRL-TR-70-16. Lowry AFB, Colo.: Technical Training Division, Air Force Human Resources Laboratory, June 1970. AD-717 712.

The purpose of this study was to determine if modification of a career development course (CDC) format through the simplification of written materials, added illustrations, and inclusion of

audio supplementation of course material could improve the CDC as a training device. This version of the CDC was designed as an aid to teach basic job information to airmen possessing minimal verbal skills.

One hundred and eighty (180) Air Force technical training students, 60 from AFQT Category I, 60 from Categories II-III combined, and 60 from Category IV served as subjects. Each group was divided into three subgroups, and each subgroup was administered a slightly different version of the fire protection career development course (CDC). One version was the conventional course, another was less verbal with more pictorial aids, and the third utilized the pictorial aids plus a tape recording reiterating information in the text. Pre- and post-training administration of the Fire Protection Experimental Test measured criterion achievement. The statistical procedure employed was analysis of variance.

Results indicated that the modified format with reduced reading level and increased number of illustrations produced significant differences in learning scores. Supplemental audio instruction produced gains for the middle and low aptitude groups. Although the two experimental texts produced higher test scores, they also required more reading and study time. High and middle aptitude groups consistently out-performed the lower mental aptitude personnel across all CDC formats.

The authors suggested that for optimal results CDCs should be written at a reading level appropriate for the majority of airmen in the career ladder. This study indicated that optimal results are achieved with a text supplemented by pictorial illustrations and audio aids.

43. Standlee, L.S. and Saylor, J.C. Feasibility of Storekeeper Class "A" School training for Group IV personnel. Research Report SRR 68-25. San Diego, Calif.: Naval Personnel Research Activity, June 1968.

This research investigated the feasibility of training Category IV personnel in the Navy's Class "A" Storekeeper School (formal training), and compared school performance with that of non-Category IV personnel in the same course.

The performance of 14 Group IV personnel was compared with the performance of 37 regular trainees. The Category IV personnel were also low performers on the GCT, i.e., scores less than 42 on the Army General Classification Test.

No changes were made in the Class A Storekeeper instructional program. Course achievement was measured both by written and practical tests administered on a weekly basis. Data were treated statistically by analysis of variance. The relationship of pre-training variables (AFQT, GCT, education, etc.) to course achievement was ascertained. Results indicated that Group IV trainees had significantly lower average pre-training variable scores and also lower average course achievement scores on both written and practical tests in all areas of instruction.

For the Group IV trainees, none of the pre-training variables were significantly related to final course grades. For regular trainees, pre-training aptitude tests, education, and age were found to be related significantly to final course grade.

Course instructors felt that the difficulties which the Category IV personnel met in the training course were due more to deficiencies in basic mathematics and reading comprehension.

It was generally concluded by both researchers and instructors that Group IV personnel who also score low on GCT should not be sent to Storekeeper Class "A" School.

44. Standlee, L.S. and Saylor, J.C. Feasibility of Steelworker Class "A" School training for Group IV personnel. Research Report SRR 69-8. San Diego, Calif.: Naval Personnel Research Activity, August 1968.

The purpose of this research effort was to investigate the appropriateness of training Group IV personnel in the Navy's Class "A" Steelworker School and to determine the kinds of training course modifications that might be required to produce effective training. Course achievement scores of Category IV and non-Category IV personnel were compared.

The sample consisted of 28 Group IV men and 33 regular trainees, both assigned to training directly from Recruit Training Command. No changes or modifications were made to the steelworker course instructional program. The Group IV and regular trainees were compared both on course achievement and pre-training variables including the AFQT, General Classification Test, education, and age. The course achievement criterion included both written and practical tests administered throughout the course. Analysis of variance was used in treatment of the data to determine whether the two groups differed in the findings.

Results indicated that the Group IV trainees were less proficient in most pre-training variables--various aptitude tests, shop practice, knowledge of subject, and education.

All trainees completed the twelve-week training course; however, three of the Group IVs did not meet graduation requirements. Group IVs scored lower than non-Group IVs on achievement tests in all areas of instruction. The difference was more pronounced on written tests than on practical tests. Inside the classroom, many Group IVs had difficulty primarily with mathematics and in comprehending lectures and reading materials. Outside the classroom, Group IVs had more problems adjusting to a military environment.

The authors suggested that Group IV personnel will have a fairly good chance of completing Steelworker Class "A" School; however, they will require more individual help and counseling, and they will tend to rank relatively low in class standing.

45. Standlee, L.S. and Saylor, J.C. Second study of Equipment Operator Class "A" School training for Group IV personnel. Research Report SRR 69-19. San Diego, Calif.: Naval Personnel Research Activity, January 1969.

The objectives of this research were to determine the feasibility of providing Class "A" level training for personnel in the lower portion of the Mental Group IV category and to compare their course performance with non-Category IV personnel.

The research compared the performance of six Group IV personnel with that of 16 regular recruit personnel in the formal school environment of an Equipment Operator Course (operation of construction equipment). The performance of the two groups was compared on pre-training variables (including age, education, and aptitude test scores), military adjustment, and course achievement based on written and performance tests regularly administered throughout the course. The statistical procedure used to determine differences was analysis of variance.

Results indicated that there were significant differences in course achievement, with the Category IV personnel performing at a significantly lower level than regular trainees in all areas of instruction. Differences were greater on written tests than on the practical tests. However, all Group IV trainees successfully passed the course. The curriculum area causing Group IV trainees the most difficulty was mathematics, even though the complexity of the mathematics portion of the course had been reduced as a result of an earlier study. In addition, the Group IV trainees had lower average pre-training test scores than did regular trainees. Within the Group IV category, however, AFQT score and course achievement were not related.

The authors also presented a comparison between the results of the study and a similar study completed earlier. The authors concluded that Group IV personnel can successfully complete the formal Equipment Operator School course although they will tend to rank low with respect to class standing.

46. Steadman, J.C., Bilinski, C.R., Coady, J.D., and Steinemann, J.H. The development and evaluation of training methods for Group IV personnel. II. Training Group IV personnel in the operation of the Electronic Multimeter AN/PSM-4. Research Report SRR 69-22. San Diego, Calif.: Naval Personnel Research Activity, March 1969.

This study investigated the feasibility of teaching Category IV personnel the operation of the AN/PSM-4 Electronic Multimeter in a formally organized course. The research also evaluated the relative effectiveness of a programmed instructional presentation versus instructor presentation of course content.

The training course involved in the study (multimeter course) was used to instruct trainees in the proper use of an AN/PSM-4 for making voltage, current, and resistance measurements.

The multimeter course was administered to two groups of Navy Category IV trainees, 31 subjects in all. Each group was divided in half. Half of each group was taught by an instructor; the other half used a programmed text. Written quizzes and a final performance test were used as course achievement criteria. The statistical procedure used was analysis of variance. Additionally, the students had completed a number of pre-training tests and these were correlated with course achievement.

The resulting criterion performance data indicated that about three-fourths of the total sample failed to demonstrate adequate learning on the final performance test. Performance of the instructor-taught group was found to be superior, but subsequent modification of the programmed text later raised that group's performance to a similar level. Course achievement was not significantly correlated with pre-training aptitude variables for Category IV personnel. Under the time and method conditions similar to those of the present study, it appears that the test equipment course is not generally appropriate for Group IV personnel.

47. Steinemann, J.H. The development and evaluation of training methods for Group IV personnel. I. Orientation and implementation of the Training Methods Development School (TMDS). Research Report SRR 69-12. San Diego, Calif.: Naval Personnel Research Activity, October 1968.

This research describes a segment of a continuing effort by the Navy Training Research Laboratory to ascertain trainability and to maximize the utilization and integration of marginal personnel in the fleet. The approach was accomplished through organization of a Training Methods Development School (TMDS) that operated an experimental training program with research controls to evaluate the relative effectiveness of alternative training content and methods for Group IV personnel.

Category IV personnel were trained in six areas: (1) Navy skills and knowledge, (2) basic hand tools, (3) dial and gauge reading, (4) soldering, (5) electronic test equipment (AN/PSM-4), and (6) practical mathematics. Practical performance and active participation were emphasized, and unnecessary theory and technical terminology were avoided in developing course content.

In addition to several standard aptitude tests, a number of pre-training aptitude tests consisting of the Navy Basic Test Battery, Navy Non-Verbal Classification Test, Surface Development Test, and Diagnostic Reading Test were initially administered to the Category IV personnel. Mean test scores obtained on the pre-training tests were intercorrelated, resulting in several significant relationships involving verbal and arithmetic skills, particularly the AFQT, GCT, ARI, and the Navy Literacy Test. The Navy Non-Verbal Test is also significantly related to 9 of the 14 other pre-training variables. The remaining variables (which assess practical factors) included BEAT, Digit Span, and Shop Practices Tests, and were found to be generally uncorrelated with the other test variables. Thus, while significant relationships were found among the various aptitude measures, aptitude tests were generally not significantly related to achievement as measured by performance tests.

The author concluded that these trainees, representing the complete range of Group IV scores, acquired a variety of skills and knowledge despite their limitations in verbal and mathematical abilities. Successful training was evidently based on capitalizing on other important aptitudinal and experimental variables.

48. Steinemann, J.H., Hooprich, E.A., Archibald, A.G., and Van Matre, N.H. Development of a "Wordsmanship" training course for marginal personnel. Research Report SRR 71-17, San Diego, Calif.: Naval Personnel and Training Research Laboratory, February 1971.

This research was an investigation of a "wordsmanship" course designed to improve the verbal ability of Category IV personnel.

A group of 176 Navy Category IV personnel underwent wordsmanship training to improve their language skills. The course emphasis was placed on the development of dictionary skills, use of indexes, spelling, reading training, and practice in test taking. The work compared pre- and post-course achievement measures as an indicator of wordsmanship learning. No statistical measures were employed.

Pre- and post-training tests indicated substantial improvement in each of the specific sub-course areas of wordsmanship. Basic word skills represent a valuable and feasible area of training for Category IV personnel. Attitudes toward language instruction also showed marked improvement. Innovative and flexible training approaches are required to overcome the typically low aptitudes of marginal personnel. Students approved and liked the use of word games and team competition to generate interest and participation as a means for improving verbal skills.

49. Steinemann, J.H. and Van Matre, N.H. Comparative evaluation of the performance of Group IV personnel in an enlisted skills training course (Lookout and Recognition). Research Memorandum SRM 69-9. San Diego, Calif.: Naval Personnel Research Activity, October 1968.

This research studied the achievement of Category IV Navy personnel in comparison to non-Category IV individuals in a Lookout and Recognition Training course.

The performance of 90 Navy Group IV personnel was compared to that of a sample of 100 individuals of higher AFQT categories in a short enlisted skills training course (Lookout and Recognition). The training course objective was to develop a trainee's ability to spot and identify ships and aircraft under a variety of conditions. The Lookout phase criterion was a written test depending largely upon verbal abilities, while the Recognition phase criterion was a performance-oriented perceptual test requiring the examinee to identify a variety of ships and planes from pictures rapidly flashed on a viewing screen.

Mean course performance measures were used for comparing groups. In addition, correlation coefficients were developed to ascertain the relationship between the AFQT and training achievement.

The findings indicated that the achievement of Group IV personnel was significantly lower than that of the non-Group-IV sample for both phases of training; and that the Group IV sample did relatively less well in the Recognition than in the Lookout training phase. Failure rates for Group IVs were substantially higher than for non-Category IVs in both phases of the training course.

The relatively inferior performance of the Category IVs on the Recognition test, which was less verbal than the Lookout test but which probably involved both memory and perceptual abilities, suggested that there may have been other higher order performance areas which presented considerable difficulties for marginal personnel. However, despite the relatively inferior mean performance of the Group IV sample, a substantial proportion of the Category IV trainees did complete training and were assigned to lookout duties aboard ship.

A significant relationship was found between the AFQT and course achievement for the non-Group IV sample and for the combined Group IV and non-Group IV sample; but not for the Group IV sample alone, the latter reflecting a restricted range of the sample.

50. Sticht, T.G. Learning by listening in relation to aptitude, reading, and rate-controlled speech. HumRRO Technical Report 69-23. Alexandria, Va.: Human Resources Research Organization, December 1969.

This report describes a number of research efforts whose objectives were concerned with the degree of comprehension achieved by listening as compared to reading, and the degree of comprehension achieved by listening to verbal material presented at different rates of speed.

In dealing with the differences in reading versus listening as a training method, the first study utilized 40 Category IV Army inductees and 56 Army inductees of higher AFQT mental categories as the sample. Groups of these individuals alternately read and listened to written materials of a specified difficulty level and were subsequently tested by specially designed comprehension tests.

The second portion of the study examined the ability of various groupings of high and low aptitude men to discriminate and comprehend listening materials presented at varying rates of speed comparable to that used when reading silently. Means and standard deviations of scores were computed and compared statistically to determine if differences in mean comprehension test scores were

significantly different. Analysis of variance was employed as an additional statistical approach.

In the comparison of listening and reading, comprehension test scores indicated that listening was as effective as reading at all reading/listening difficulty levels, for both average and low aptitude personnel. The reading and listening comprehension of the average mental aptitude group, however, surpassed that of the lower aptitude personnel. Additionally, there were many individual differences with some individuals of both mental aptitude groups performing better by reading than listening, and vice versa.

The results of the studies concerned with the comprehension of mechanically speeded speech (rates comparable to silent reading) indicated comprehension was positively related to mental aptitude for both low and high mental aptitude groups. Men of both high and low aptitude levels improved their comprehension test performance after listening to speeded speech at the 275 words per minute (WPM) rate. (Normal speech rate is 175 WPM.) Results also indicated that listening to a speeded selection presented twice in the same amount of time normally required at the 175 WPM rate did not improve the peak comprehension of either high or low aptitude personnel.

The author concluded that certain materials may be presented as effectively through listening as through reading regardless of mental level and that moderately increasing the rate of speech may improve listening comprehension.

51. Sticht, T.G. Learning by listening in relation to aptitude, reading, and rate-controlled speech: Additional studies. HumRRO Technical Report 71-5. Alexandria, Va.: Human Resources Research Organization, April 1971.

This report presents a series of experiments related to the feasibility of substituting listening for reading in Army training programs for men of lower mental aptitude levels.

Part One of the study explored the preference for listening as opposed to reading and its relationship to the reading grade level and AFQT Mental Category of the subject. The sample consisted of 411 men, 85 of whom were Category IV personnel in advanced Army training programs. Simple percentages provided the basis for conclusions.

Findings indicated that the preference for listening was inversely related to both reading level and AFQT mental category. Preference

for learning by listening ranged from 14 percent for men with high reading abilities to 45 percent for men with poor reading capability. Twenty-eight percent of the Category IV men surveyed preferred learning by listening while only eight percent of the Category I men expressed this preference. Overall, some 25 percent of a sample of 300 subjects preferred learning by listening rather than by reading.

Part Two presented the results of five experiments primarily related to the comprehension of mechanically speeded speech. For these studies (with one exception) the subjects consisted of various numbers of Army inductees of either high (AFQT scores 80 or above) or low (30 or below) aptitude. The one exception was an experiment related to the evaluation of reading difficulty which utilized 10 professional staff members of the HumRRO research division. Speech materials consisted of tapes of various passages presented at different speeds. Specially developed tests were used to measure comprehension.

In addition to studying the effects of speeded speech on retention, an attempt was made to determine the impact of speech distortion (as a result of speech speeding) on comprehension.

The statistical interpretation of the resulting data was accomplished by using analysis of variance.

Results of these experiments indicated that speech rate due to the time-comprehension process rather than signal distortion appeared to be the major cause of decreased comprehension of materials presented at fast rates of speech for both low and high aptitude men. Also, comprehension decreased as a function of mental aptitude, the difficulty level, and the speech rate of the selection presented. No differences were found between the types of information learned by high and low aptitude men. However, differences existed in the amount learned, with the lower aptitude level personnel achieving less than the higher mental aptitude men, especially from the listening selections.

The results also indicated that the optimal speech rate for high aptitude men may be somewhat faster than for low aptitude men.

Finally, using the time saved by speeded speech to present additional new information did not increase comprehension over that obtained by presenting less information at the normal speech rate.

From a technical aspect it was also learned that reading materials can be scaled for listening difficulty by magnitude estimation,

a readability formula, close techniques, recall tests, or direct category scaling procedures. Correlation coefficients among these methods range from .85 to .95.

52. Sticht, T.G., Caylor, J.S. Kern, R.P., and Fox, L.C. Determination of literacy skill requirements in four military occupational specialties. HumRRO Technical Report 71-23. Alexandria, Va.: Human Resources Research Organization, November 1971.

This report is a summary of the research done under HumRRO Work unit REALISTIC, the objective of which was to provide information on the reading, listening, and arithmetic skills of servicemen in highly populated MOSs.

Category IV and non-Category IV men in four Military Occupational Specialties (MOSs)--general vehicle repairman, unit and organizational supply specialist, armor crewman, and cook--served as subjects. The reading, listening, and arithmetic skills of each of these men were evaluated, and the relationships between skill level and performance on job knowledge tests, job sample performance tests, and supervisor's ratings were examined. Selected number of the men were interviewed to provide information about their job-related reading, listening, and arithmetic skills. A readability formula was applied to certain printed materials used in each MOS to provide information on the reading level demands of that MOS. Correlation coefficients were computed between each of the measured skills and each of the performance measures.

Results included the following:

- Both reading ability and AFQT scores were related to job proficiency as measured by a variety of tests.

- The reading difficulty of printed job materials (except for the Cook MOS) far exceeded the reading ability of both high and low aptitude men.

- Listening ability was related to job proficiency when measured by either job knowledge or job sample performance tests. One-fourth of a sample of some 300 men preferred listening to reading; one-half of the very poor readers expressed a similar preference. The frequency of listening, relative to reading, as a means of gaining information on the job was higher for poor readers in MOSs where reading materials were most difficult. Category IV men said they obtained almost three-fourths of their information by listening.

- Arithmetic skill was related to reading, AFQT, job knowledge scores, and job sample test scores. Overall, demands for arithmetic skills did not exceed what is ordinarily taught in the first six grades in school.

These results led to conclusions indicating that greater use of job required reading materials, and hence better job performance, might be stimulated by either upgrading the literacy skills of personnel involved, or by reducing the difficulty levels of the materials, or both.

- Also, consideration should be given to supplementing the AFQT with a reading test. The reading test appeared to be a better predictor of proficiency on job reading tasks and was more diagnostic in nature, identifying skill areas in which remedial training might prove beneficial.

- Finally, since performance on job knowledge tests influences retention and promotion, efforts should be made to ensure that men have the opportunity to acquire both the job knowledge and the literacy skills necessary to complete these tests effectively.

53. Van Matre, N.H., Harrigan, R.J., and Archibald, A.G. A comparative evaluation of the Group IV personnel assigned to the USS Catskill. Research Report SRR 69-7. San Diego, Calif.: Naval Personnel Research Activity, August 1968.

This report evaluated the aptitude characteristics, training development, and early shipboard performance of Category IV personnel assigned to the mine countermeasures support ship USS Catskill.

The study sample consisted of 116 Group IV and 82 non-Group IV unrated Catskill seamen. Data were obtained from service records, training course records, and supervisor interviews. The performance criterion consisted of final training course grades in eight Navy training courses. Tests for significance were used in evaluating the differences between mean performance of the two groups. Pearson correlation coefficients were also computed to determine the relationship between pre-training variables (for example, AFQT scores, years of education, etc.) and training course grades.

Comparison of background characteristics and performance of the Group IV and non-Group IV personnel indicated that: (a) The Group IV sample had, on the average, a lower chronological age,

tying test, compass and relative bearing test, and a sound-powered phone test. Additionally, personnel records were reviewed and a supervisory rating was issued for each individual. The mean achievement test and performance scores were used for statistical analysis.

Group IV personnel scored significantly lower on the written general Navy Knowledge test than did non-Category IVs but did not perform differently from non-Category personnel on the performance tests. However, Group IV men were rated lower than the non-Group IV personnel on two different supervisory rating scales. Comparisons of personnel records showed the Group IV personnel experiencing more disciplinary actions, completing fewer training courses, and advancing in pay grade at a slower rate than the non-Group IVs.

In general, this study substantiated the trends reported in the earlier USS Catskill study: that Category IV personnel can adequately perform most lower-level shipboard assignments, and may be feasibly utilized in the Navy, though, as a group, less efficiently from an overall aspect than non-Category IV personnel.

55. Van Matre, N.H. An Instrument Reading training course for Group IV personnel. Research Report SRR 71-26. San Diego, Calif.: Naval Personnel and Training Research Laboratory, May 1971.

This research was concerned with the development and evaluation of an Instrument Reading Training Course for Group IV personnel.

An Instrument Reading Training Course was developed as one part of the Training Methods Development Program established by the Naval Personnel and Training Research Laboratory, San Diego, for Category IV personnel.

One hundred eighty-eight (188) Group IV men received training under a variety of methods: (a) formal classroom training, (b) on-the-job instruction, and (c) self study. Criterion data were obtained from individual performance on a written instrument reading test administered before and after training. Statistical treatment consisted of analysis of variance.

Group IV personnel were trained to read Navy measurement devices to a skill level approximating that of experienced non-Group IV men. The most effective method for training Group IV personnel was the use of self-study workbooks which contained both

instructional material and practice worksheets. Training which required active student participation was found to be more effective than either conventional classroom lecture or simulated "on-the-job" training.

56. Vineberg, R., Sticht, T.G., Taylor, E.N., and Caylor, J.S. Effects of aptitude (AFQT), job experience, and literacy on job performance: Summary of HumRRO Work Units UTILITY and REALISTIC. HumRRO Technical Report 71-1. Alexandria, Va.: Human Resources Research Organization, February 1971.

The purpose of this report was to provide a summary of the research and results associated with HumRRO work units UTILITY and REALISTIC.

WORK UNIT UTILITY

Work produced under HumRRO work unit "UTILITY" was undertaken to determine the comparative performance and suitability for military service of Mental Category IV personnel who entered the Army as a result of Project 100,000.

This research effort evaluated the work performance of job incumbents in four military occupational specialties: armor crewman, general vehicle repairman, unit organizational supply specialist, and cook. Individual performance was evaluated using actual job sample performance tests, paper-and-pencil job knowledge tests, supervisor evaluations (ratings), and individual background characteristics.

Category IV individuals were matched with non-Category IV personnel to afford a comparison of performance between the two groups. The sample population of the four military occupational specialties numbered 1,570 individuals. Statistical treatment of data included both correlational analyses and tests of differences of performance.

Work unit UTILITY results indicated that job performance was directly related to both AFQT and job experience. Job experience (time on job) correlated more highly with actual performance than did the AFQT. Supervisor ratings did not differentiate men at different AFQT or job experience levels. The job performance of Caucasians and Negroes did not differ despite the lower AFQT scores of Negroes. Additionally, performance of inductees and enlistees did not differ during their first 23 months of active Army service. The authors provided recommendations suggesting

that the Army should continue its policy of accepting individuals at lower AFQT levels inasmuch as a sizeable proportion of the lower aptitude individuals performed at acceptable levels on the job.

WORK UNIT REALISTIC

Work associated with HumRRO work unit REALISTIC was undertaken to provide information concerning the demand for reading, arithmetic, and listening skills and their relationship with work performance for low mental level (Category IV) individuals. An additional objective was the determination of the readability of publications directly utilized within certain military occupations.

The relationship between reading, listening, and arithmetic skills and work performance indices was examined for the same individuals of work unit UTILITY in the same four military occupational specialties. Additionally, readability levels of publications directly related to the military occupational specialties cook, supply specialist, and vehicle repairmen were examined. Statistical analysis consisted of correlational analysis and tests of differences of means. The sample population of work unit REALISTIC numbered 1,564 individuals.

Reading, listening, and arithmetic skills were all found to be positively related to job performance. The portion of the study related to the comparison of listening and reading in the learning of prose materials indicated that listening produces an equal level of learning for both Category IV and non-Category IV personnel. A significant proportion of individuals at lower reading levels indicated they preferred to learn by listening rather than by reading. Reading ability was found to be related to job proficiency when measured by performance on job reading task tests. The reading test score was more closely related to proficiency on job reading tasks than was the AFQT.

Listening ability was related to job proficiency when measured by either job knowledge or job sample performance tests.

Only inconsequential relationships were found between supervisor ratings and the literacy variables.

The portion of the research concerned with readability indicated that the publications in the repairman and supply fields exceeded the average reading level of the non-Category IV personnel by

four to six grade levels and exceeded the average reading level of the Category IV individuals by six to eight grade levels.

Arithmetic skill was found to be highly related to reading and AFQT performance and predicted job performance about as well as these indices.

57. Vineberg, R., and Taylor, E.N. Performance in four Army jobs by men at different aptitude (AFQT) levels: 3. The relationship of AFQT and job experience to job performance. HumRRO Technical Report 72-22. Alexandria, Va.: Human Resources Research Organization, August 1972.

Four MOSs (Armor Crewman, General Vehicle Repairman, Unit and Organizational Supply Specialist, and Cook) were selected for studying the performance and characteristics of both marginal men and comparison groups from the upper aptitude levels. Approximately 375 men were studied in each MOS.

Information about the job effectiveness of each man was obtained through job sample tests, job knowledge tests, and supervisor ratings. Information about each man's background, personal characteristics, and Army experience and training was obtained through biographical questionnaires, a battery of published and experimental tests, and Army records. Information about each man's typical daily job activities was obtained through questionnaires administered to the men themselves and to their supervisors.

The findings of this study are descriptive and restricted to men who were working on a continuing daily basis in four different military jobs. While different jobs were studied, no distinctions are made between MOSs in this summary because the findings were so similar.

(1) Job performance, as measured by job sample test scores, is directly related to both AFQT and job experience. Job experience, however, shows a more profound effect than AFQT where a considerable overlap in the performance distributions of different AFQT subgroups was observed. While average performance of different AFQT subgroups shows separation up to approximately five years in the job, with time an increasing proportion of men at all AFQT levels appear in the upper ranges of the performance distribution. The data suggest the potential loss of a sizable number of good performers if men with AFQT scores below 20 are excluded from the service. Thirty-three percent of the men in this group with 1-18 months of job experience performed above the median,

whereas 25 percent of the 65-99 AFQT group scored below the median. Fifty percent of the 0-20 AFQT group with 19-30 months of job experience and 85 percent with more than 30 months of job experience scored above this same median.

(2) Separation in the performance of different AFQT groups on Job Sample subtests increases as the subtests increase in difficulty.

(3) Beyond 30 months of job experience, there is a clear and stable floor of performance. This floor could be used to define minimum acceptable performance.

(4) Job Knowledge scores correlated more highly with Job Sample scores than any other variable in the study (except job experience).

(5) Supervisor Ratings (scales of the Commander's Evaluation Report) do not differentiate men at different AFQT or job experience levels. The ratings are highly skewed toward the favorable end of the scale and bear only a moderate relationship to Job Sample and Job Knowledge criteria.

(6) AFQT is not related to the types of tasks a man is assigned in his job, nor to the frequency with which he performs them. The amount of time he has been in his job may be related to some of the tasks he performs.

(7) The job performance, as measured by job sample tests, of Caucasians and Blacks does not differ despite the lower average AFQT of the latter.

(8) Job performance of inductees and enlistees does not differ during their first 23 months in the Army.

Based upon the results of this study, the primary implications are:

(1) The Army could accept men at lower AFQT levels.

(2) Screening for retention could be undertaken at the time of the first reenlistment.

(3) Supervisor Ratings (Commander's Evaluation Report) provide evaluations of general personality characteristics rather than of job proficiency; they are highly susceptible to rater bias, and they fail to provide useful discriminations between men with regard to job performance.

58. Vineberg, R., and Taylor, E.N. Performance in four Army jobs by men at different aptitude (AFQT) levels: 4. Relationships between performance criteria. HumRRO Technical Report 72-23. Alexandria, Va.: Human Resources Research Organization, August 1972.

This report examines the suitability of different criteria in relation to the specific behavioral demands of a job. In particular, it focuses on the usefulness and relationships among three types of criterion instruments: job sample tests, job knowledge tests, and supervisor ratings. Each of these instruments was used to assess men working in the four Army jobs--Armor Crewman, General Vehicle Repairman, Unit and Organizational Supply Specialist, and Cook--that were included in Work Unit UTILITY, a comparative study of the performance of men in different mental ability groups.

Practical constraints often dictate that relatively simple and inexpensive measures be used to assess job proficiency. The report explores the interchangeability of job knowledge and job sample tests, and the considerations that govern the suitability of such substitution. An analysis of the skill and knowledge requirements of the job sample tests suggested that well-constructed knowledge tests could be substituted for job sample tests in the four jobs studied.

The interrelationships of job sample tests, job knowledge tests, and supervisor ratings were then determined for the entire samples and for selected subsamples: low vs high reading ability groups, Mental Category IV vs Non-IV groups, low vs high verbal aptitude groups, low vs high educational level groups, and Black vs White groups. These data support the analyses and conclusions already reached.

Correlations between job sample test scores and job knowledge test scores in the four jobs ranged from .58 to .72.

Correlations between job sample test scores and supervisor ratings ranged from .20 to .28. Correlations between job knowledge test scores and supervisor ratings ranged from .23 to .35. Subsample correlations were similar.

It was concluded that where job performance is mediated almost solely by knowledge per se, job knowledge tests should be used to assess the information a man has about his job. Where job performance relies almost solely on skill, job sample tests or some other variety of performance measure is essential. Where job performance depends upon a mix of knowledge and skill, both knowledge tests and performance tests are indicated.

59. Vineberg, R., Taylor, E.N., and Caylor, J.S. Performance in five Army jobs by men at different aptitude (AFQT) levels: 1. Purpose and design of study. HumRRO Technical Report 70-18. Alexandria, Va.: Human Resources Research Organization, November 1970.

The objective of this research was to provide information concerning the performance and characteristics of marginal aptitude men in the Army. This report, the first of a series of reports resulting from HumRRO Project UTILITY, describes the rationale, research design, and performance criteria and covers the personal characteristics and background of the sample. Data were collected from permanent records, job sample tests, job knowledge tests, Enlisted Efficiency Reports, and several specially designed and administered tests.

Five Military Occupational Specialties (MOSs) were chosen for study: armor crewman, general vehicle repairman, unit and organizational supply specialist, medical specialist, and cook. Each MOS studied was representative of job counterparts in civilian occupations and was used for assignment of high percentages of low aptitude men. At various units in the continental United States and overseas, approximately 900 Category IV men in the designated MOSs were selected and matched with individuals of the same MOS with similar length of service but of a higher AFQT category. The total sample numbered 1,836 individuals. This report compared various background and personal characteristics of these Category IV and non-Category IV men.

Results of the comparison indicated that marginal men were more likely to come from culturally-disadvantaged backgrounds, and that the AFQT score is highly correlated with years of education and other mental aptitude measures. There was no relationship between AFQT and marital status and little relationship between AFQT and attained pay grade level. Most of the Blacks in the sample were of lower mental categories, and a proportionately larger number of Blacks tended to remain in the Army. A lower proportion of Blacks and Project 100,000 men were assigned to the general vehicle repairmen MOS, a job with great civilian transfer. Many comparisons were cited among the five MOSs in terms of aptitude scores, length of service, civilian transfer, and reenlistment.

60. Vineberg, R., Taylor, E.N., and Sticht, T.G. Performance in five Army jobs by men at different aptitude (AFQT) levels: 2. Development and description of instruments. HumRRO Technical Report 70-20. Alexandria, Va.: Human Resources Research Organization, November 1970.

This report, completed under HumRRO Work Unit UTILITY, describes the development of instruments to evaluate job performance and

job knowledge, and provides background information for men in five selected MOSs. These instruments were later used to provide information about the performance of Category IV men compared to non-Category IV men assigned to these same MOSs and to identify factors associated with satisfactory performance in the different mental categories.

Five MOSs--armor crewman, general vehicle repairman, supply specialist, medical specialist, and cook--were selected for study because many Category IV men are assigned to these jobs and because they provided the promise of civilian job transfer.

Job sample tests were developed for each MOS utilizing enlisted men as test content advisors. Each test consisted of a number of sub-tests, each sub-test consisting of a task appropriate to that MOS.

Multiple choice paper-and-pencil job knowledge tests for each MOS were developed using job analyses and based on previously developed tests.

A supervisor's rating scale was developed which consisted of questions which could be answered "yes" or "no" by a supervisor concerning a man's initiative, reliability, and other performance factors. The eleven items of the performance evaluation questionnaire were supplemented by 14 rating scales taken directly from the Army "Enlisted Efficiency Report."

Men in each MOS were asked to name the three tasks they spent most of their time doing and three tasks they performed yesterday. Supervisors were administered a questionnaire containing five similar items. The results of these analyses of job duties were to be published later in the UTILITY series.

A battery of tests and questionnaires were designed to provide information about background and personal characteristics. A 56-item personal questionnaire provided information concerning a subject's family, education, and pre-military history. An activities checklist identified activities a subject had participated in "fairly often" before the age of 14. An environmental participation index was included to provide a measure of socioeconomic status. This two-part checklist required a subject to identify items which were available in his home at age 15 and to identify activities that he had accomplished by age 18.

Several tests were included which measured non-verbal intelligence. The D-48 (Domino) test, the Oral Directions Test, the

Group Maze test, and the Memory for Numbers Test provided measures of general intelligence not available in the standard military test batteries..

A Hand Skills-Judgment test developed by the research team was included as a measure of motivation.

Finally, a survey of reading achievement, a survey of arithmetic achievement, and a listening performance evaluation were developed to provide information concerning each man's proficiency in those areas.

Copies of most of the instruments used in the research are included in the appendices to the report.

61. Weingarten, K., Hungerland, J.E., and Brennan, M.F. Development and implementation of a quality-assured, peer-instructional model. HumRRO Technical Report 69-19. Alexandria, Va.: Human Resources Research Organization, November 1972.

The program of research reported described the evolution of both an instructional methodology and end-of-training achievement criteria that dealt with the problems associated with (1) widely differing aptitudes in the same class and (2) the distributions of mastery levels associated with traditional methods of instruction.

The goal of the research was the development of a low-cost, generalizable instructional model that would accommodate a wide range of aptitudes and achieve (effective) uniform achievement levels.

The research and development of the instructional methodology was performed in an operational setting using the Field Wireman course as a test bed. The Field Wireman course encompassed a wide range of skills and tasks, and the student flow represented a broad spectrum of ability including a substantial portion from AFQT Category IV.

The resulting instructional model based on the principle of peer instruction and 100 percent mastery of all tasks was developed and implemented without any requirement of additional personnel or equipment. A main element in the development of the model was successfully devising a task scheduling management system in which each student was occupied at learning a task or tutoring a student on a task. This system altered in a fundamental way the role and function of the instructor from dispensing information to monitoring and insuring quality control.

This unique model as applied to the Field Wireman course was developed with thirteen performance oriented mastery tests with a criterion of 100 percent mastery. Comparisons between the experimental course and the conventional course were made on student performance, attrition, recycles, and on costs. Also, comparisons were made between Category IV and non-Category IV peer-instructed students on number of retests, time to mastery, and attrition. Statistics employed were simple means and chi-squares.

The peer-instructed students (N = 295) were much more proficient at job-performance tests (mean scores of 100 percent versus mean scores of from 77 percent to 40 percent on various segments of the course), had a significantly lower attrition rate (12.5 percent versus 19 percent), and had a significantly lower recycle rate (1 percent versus 30 percent) than the conventional course students (N = 303). In addition, it was estimated that the peer-instruction method would give a training savings of approximately 260 dollars per graduate. Within the peer-instructed group, the Category IV students generally required slightly more time and a slightly greater number of re-tests to achieve mastery and had twice the attrition rate of the non-Category IVs.

The peer-instruction model was so successful in its test in the Field Wireman course that it was implemented for all training of wiremen under the jurisdiction of the Southeastern Signal School.

62. Wilbourn, J.M., and Guinn, N. Feasibility of using special measures in the classification and assignment of lower mental ability airmen. AFHRL-TR-73-31. Lackland AFB, Texas: Personnel Research Division, Air Force Human Resources Laboratory, November 1973.

In an attempt to strengthen current selection and classification procedures which consist primarily of verbal aptitude tests, a battery of non-verbal tests was assembled to determine whether these measures could be used to assess more accurately the true potential of lower mental ability airmen.

A battery of 11 non-verbal tests along with a biographical inventory was administered to a sample of 2,362 non-prior service enlistees selected to attend one of seven technical schools. A multiple linear regression analysis was applied to the non-verbal tests to investigate their usefulness in predicting technical school performance.

It was found, for the lower mental ability groups, that the relationship between each of the non-verbal tests and final technical school grades varied among career fields. With the total group, a greater number of non-verbal tests was found to be significant with the criterion. However, in both the low mental ability and total groups, certain subtests appear to be significantly related to the criterion measures in a majority of courses.

For the total group subsamples, multiple correlations based on a composite of all the non-verbal tests were significantly related to the criterion in every course; in the lower ability subgroup analysis (two schools dropped for lack of subjects), correlations were significant in only three of the five courses. The variability in significance between the total and lower ability groups could be a function of sample size since the number of Category III and IV personnel was small in several courses. When regression weights were cross-applied to another sample to estimate the stability of the obtained relationships, the non-verbal relationships remained significant in only four of the total group courses along with one lower ability group course. Nevertheless, it is apparent that non-verbal measures do have a sizeable relationship with the final technical school performance, and further investigation of the value of these measures appears warranted.

With the possibility of an increased number of lower ability airmen enlisting in the volunteer force, the need to optimize selection and classification procedures to achieve maximum utilization of available manpower resources becomes imperative. Results of this research indicate that non-verbal tests do add significantly to our current operational indexes in many instances. The authors suggested that an expanded project be undertaken to evaluate more thoroughly the usefulness of non-verbal data in the selection process.